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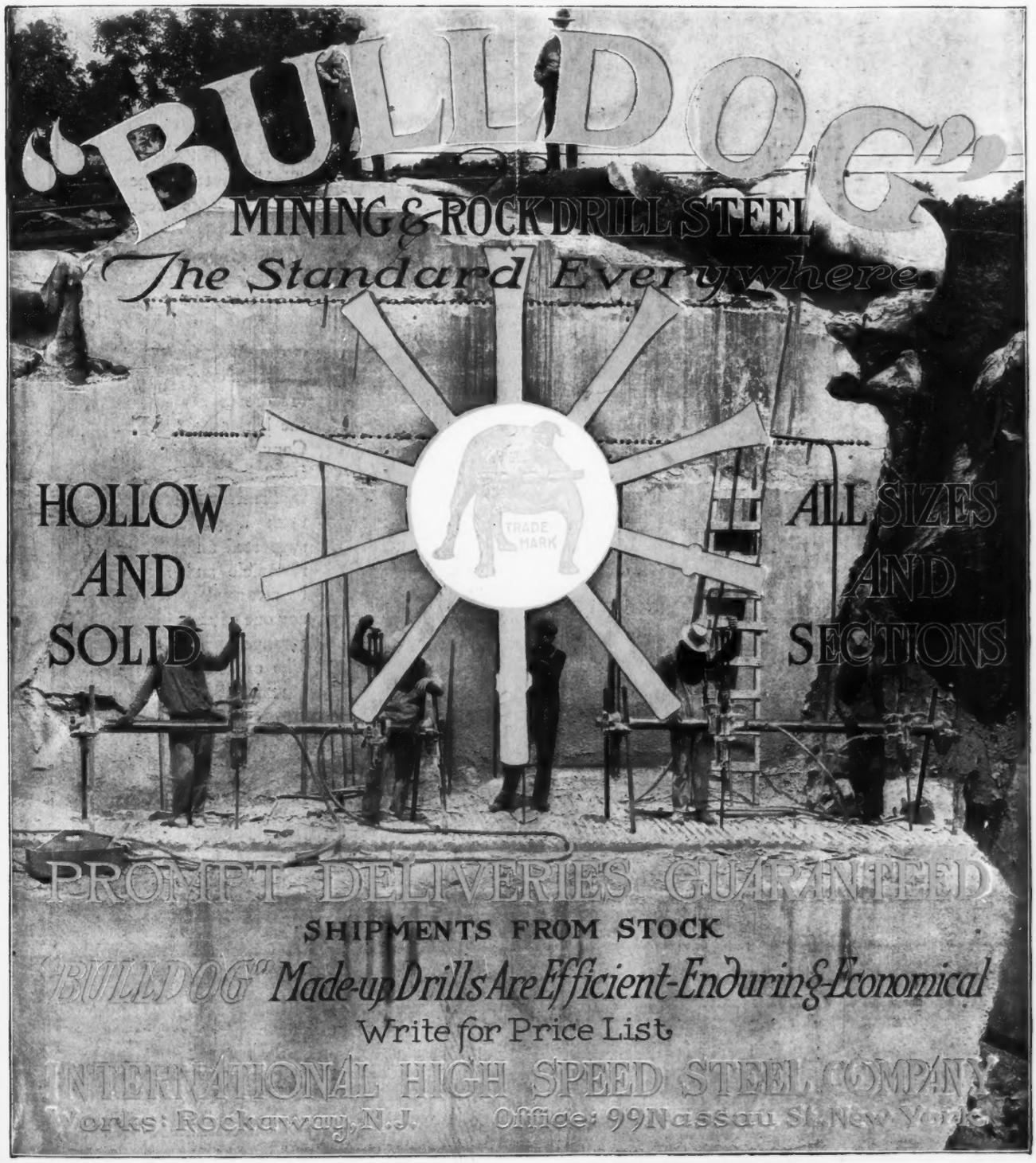
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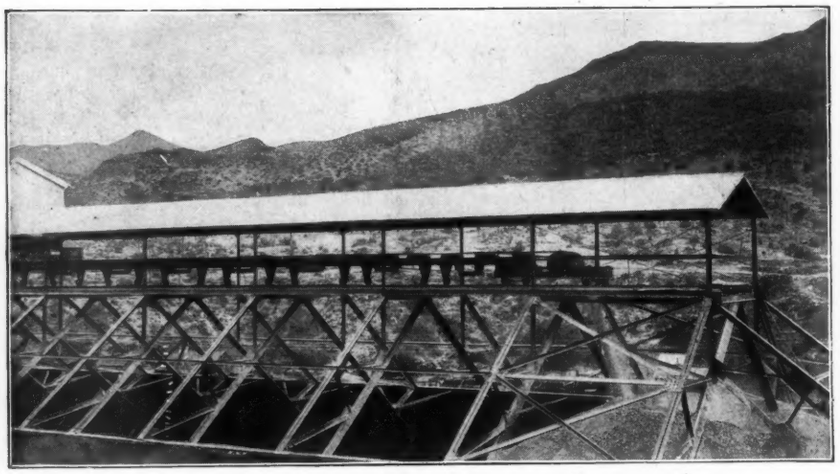

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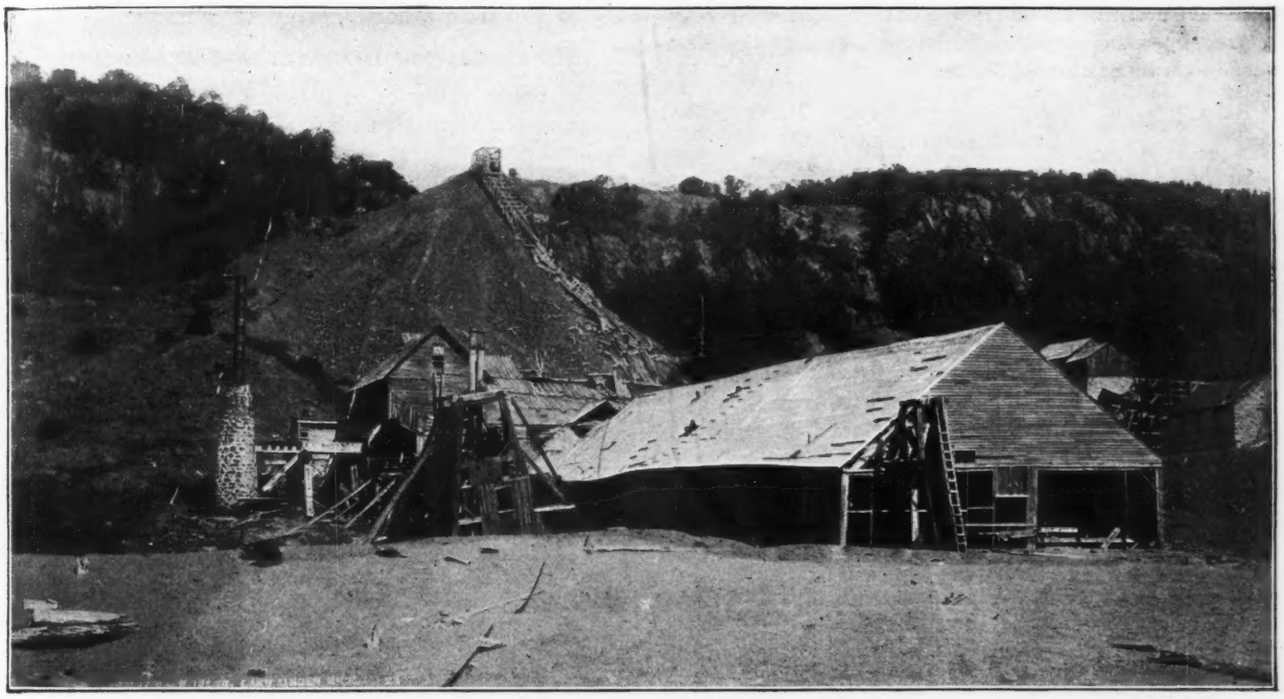

THE CLIFF MINE IN 1905, THE GREENSTONE IN THE BACKGROUND SHOWING THE CROSS-BREAK

The Porphyry Intrusions of the Michigan Copper District

BY THOMAS S. WOODS*

The genetic relationship of the porphyries of the Southwest has been fairly well established, and in the following generalized account of the relation of the fine-grained volcanics to the mineralization of the Michigan copper-bearing formations the author presents arguments to prove that the porphyry intrusions have considerable influence on the Lake Superior copper deposits. Undoubtedly more importance ought to be attached to the presence of porphyry areas in the Michigan copper district, and though it is possible that many geologists may challenge the opinions expressed, it is desirable that an inspiration to further enlightening discussion of the subject be created.

NO ONE with even a limited knowledge of geology and mining practice can study A. C. Spencer's "Professional Paper 96"[1] on porphyry in general, and the Ely district of Nevada in particular, and then make visits underground and on surface with well-known engineers in the Jerome, Globe, Ely, Tintic, and Bingham camps of the Southwest, without being convinced that too little attention has been given to the felsite-porphyry intrusions of the Michigan copper range as possible sources of enrichment.

The terraced porphyry mountain of low-grade ore developed on an enormous scale by the Utah Copper Co. is especially an object lesson. In the Jerome district a similar mountain of richer ore, now mined through shafts by the United Verde Co., is soon to be stripped of overburden and worked by steam shovels after the manner of the Utah mine. In all the Southwestern mining camps mentioned, the richest deposits are found, as a rule, at considerable depths in highly altered limestones and schists, near porphyry contacts. The general opinion of Western mining men is that enriched areas were altered and mineralized by hot solutions and

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[1]U. S. Geological Survey, 1917.

vapors, under pressure, that rose with or after the upsurges of porphyry, circulated through fissures and later leached downward. It is generally agreed that the porphyry masses which are present below the surface are more extensive than those that appear in the scattered outcrops.

It is interesting to note that, in Michigan, diamond drilling at the Mayflower mine showed a rich deposit of copper at an average depth of more than 1000 ft., in a thick belt near an unexplored outcrop of quartz-porphyry, now much eroded and leached, east of the Kearsarge lode in Sections 4, 8, and 9.

Relation of Porphyry and Other Intrusions to Ore-Bearing Lodes

In the Lake Superior copper district there are at least two, and probably three, horizons of porphyry or other intrusions, many of which are dikes and sills showing slight mineralization. One of these horizons follows Conglomerate 8 for a hundred miles from the region of Lake Gogebic northeastward to Keweenaw Point, with infrequent outcrops of felsite-porphyry, mostly on the eastern side of the conglomerate. Foster and Whitney in 1850 observed that the fissile chlorite rock occurring at the base of Mount Bohemia continued almost uninterruptedly to Portage Lake, always preserving the same relation to the trap and sandstone. A second horizon, approximately two miles further west, running parallel to the first, includes the Chippewa felsite (between the Porcupine Mountains and Winona) and straddles the greenstone north of Portage Lake. A third porphyry horizon, within the outer conglomerate, is indicated by disseminated native copper with sulphides occurring under the Nonesuch shales in the region of the White Pine mine. About 1850 some development work was done on this zone a few miles west of the Ontonagon River. The same belt has recently been explored by drills north of Portage Lake.

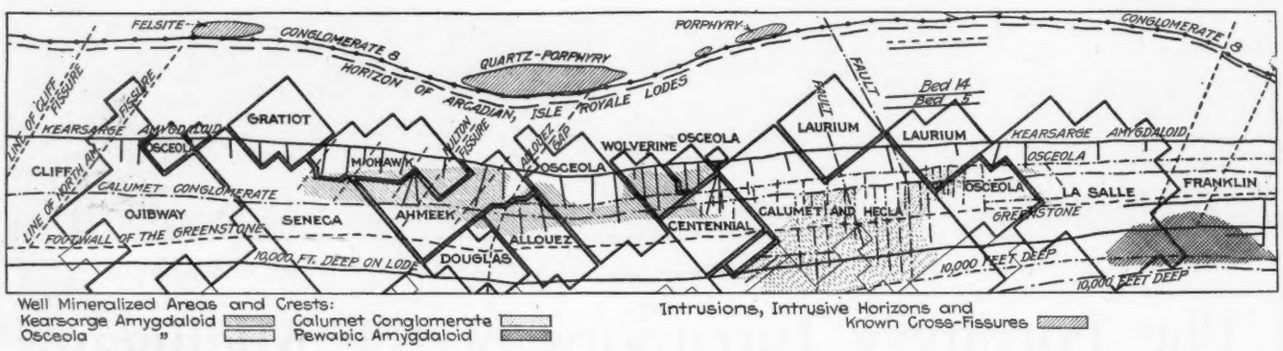
Kearsarge Lode Crossed by Mineralized Fissures

Ahmeek, with copper at the grass-roots, mines the richest mineral crest on the Kearsarge lode, which is here crossed by a series of mineralized fissures, one of them known to extend south-southeast from the greenstone almost to the above-mentioned outcrop of quartz-porphyry in Sections 4, 8, and 9. These cross-veins, in the lower levels of the mine, show a tendency to narrow and to cause less disturbance. Allouez Gap and Hill Creek mark other probable channels for the passage of copper-bearing solutions and vapors that had their sources in common with the intrusions on either hand, although excessive shattering tended to produce leached conditions, especially along the Gap, at least to considerable depths. All the important cross-fissures from Cliff to Allouez are marked by streams, and several of them have been found to be rich in copper near the point of contact with the greenstone foot wall. Foster and Whitney asserted that no permanently productive cross-vein had been discovered on Keweenaw Point which varied 15° from a north-northwest course.

Mineralization Indicated by Cross-Fissures

The upper valley of Hill Creek indicates a diagonal break in the formation intersecting several of the mineralized cross-fissures, one of which cuts Mohawk No. 1 shaft, where a rich pocket of ore was found in a lean section of the lode near the point of intersection. The same combination of fractures, in better ground, occurs near the new Seneca shaft, again north of Ahmeek No. 2, and should be found at greater depth under Ahmeek No. 3 and No. 4. The parallel cross-fissures mark the direction of the so-called "north shoots" of copper; diagonal fissures, the less common "south shoots." United Verde Extension and Gadsden, in the Jerome camp, show a like system of faulting, which, in mineralized areas, offers favorable opportunities for enrichment. The Wolverine-South Kearsarge mineral crest implies an uncharted porphyry in Sections 17, 19, and 20. On Section 17, in the Old Colony tunnel, "a much decomposed poikilitic rock with decomposed feldspar in abundance, breaking into angular fragments," and "a much brecciated . . reddish felsitic-looking rock" indicate such an intrusion so altered as to make identification difficult. In the southeast quarter of Section 19, near the junction of the trap and sandstone, the old New York & Michigan Co. explored a red and green chlorite rock, fissile but not stratified, enveloping masses of amygdaloid, with native copper occurring in the small veins and also in the adjoining fissures.

The course of Conglomerate 8 does not run parallel to that of the Kearsarge. Apparently the quartz-porphyry in Section 4 pushed this bed to the west, though further south other important intrusions (that make the geology of the Torch Lake property so puzzling) crowded it to the eastward. Here there are possibilities of a double fold like that at South Lake in the neighborhood of other extensive intrusions. In Section 16 (New Baltic) the conglomerate is again bent to the west, as in Section 4.



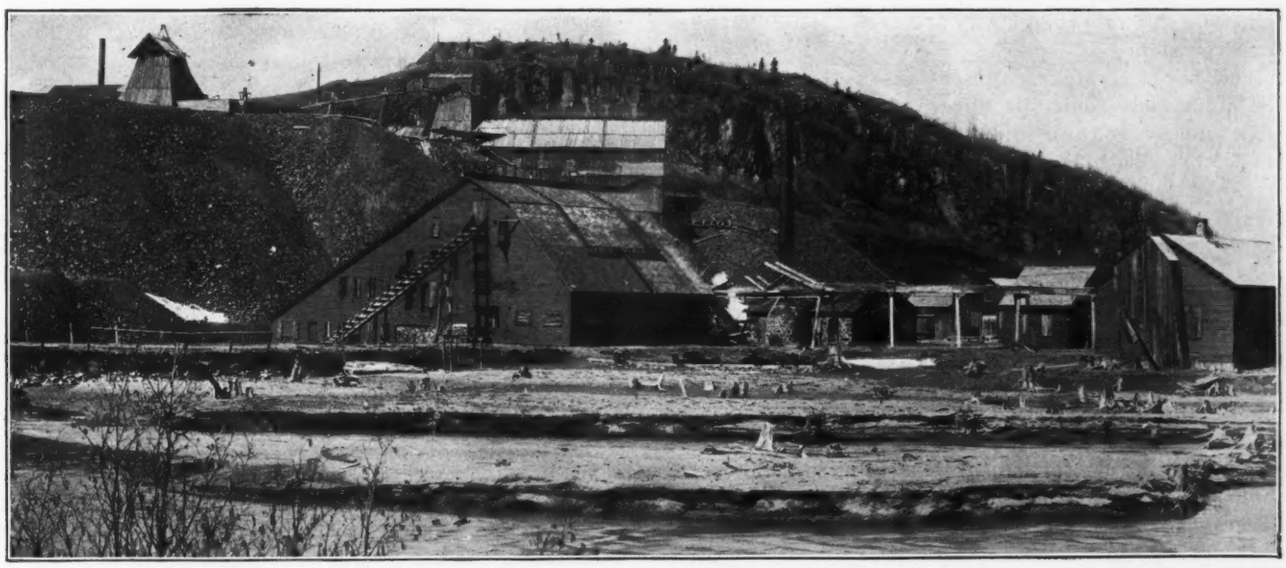
MAP SHOWING THE GREENSTONE FOOT WALL, KEARSARGE LODE, CONGLOMERATE 8, INTRUSIONS, FISSURES AND THE PRINCIPAL MINERAL CRESTS

The augite-porphyrite sills and unexplored quartz-porphyries of Torch Lake lie southeast of the great Calumet & Hecla mine on the Calumet conglomerate lode, which has not yet been found to be well mineralized at any other point. The copper ground on the conglomerate near the surface consists of two irregular crests, uniting 2500 ft. below the outcrop, and lengthening northward and southward at greater depths. A diagonal fault striking nearly west intersects each crest. The Douglas Creek valley, through which passes the electric railroad and the highway, extends from the northern crest southeastward across the intrusions, in a direction parallel to that of the cross-fissure system occurring further north in Ahmeek and Mohawk ground. It is likely that this valley marks an important cross-fissure, through which the northern crest of the conglomerate mine was enriched. The lengthening of the deposit at depth may have been due partly to contributions from the greenstone horizon of intrusions and partly to leaching. Between the southern crest of the conglomerate mine and the porphyry outcrops are Osceola shafts Nos. 1, 2, 3, and 4 on the Osceola lode (where rich ground was opened), and three unidentified amygdaloids, further to the southeast, which were shown by shallow drills to carry good copper ore in Torch Lake territory, but none in La Salle ground. Although surface indications are lacking, it is possible that there is another parallel fissure here. The absence of mineralization in the Laurium shaft on the Kearsarge lode at this point, for which various explanations may be offered, is admittedly a flaw in the argument.

Previous to 1850, the old Trap Rock Co., exploring in Section 8, just west of the Mayflower intrusion, found disseminated copper in a fine-grained porphyrite similar to Bed 59 of the Torch Lake section, which is near the quartz-porphyry outcrop and has many characteristics of a sill. The beds are in the same horizon, ranging and dipping with the formation. In 1914 a like bed was cut by a drill on Tamarack ground east of the Seneca in Section 20, just southeast of a much-disturbed and altered area. The line of the famous Cliff Fissure, extended south-southeast, intersects both of these points.

In Section 16, southeast of the rich discovery drill holes of the New Arcadian and of Franklin Junior on the Isle Royale-Arcadian lodes in the adjoining Section 9, explorations conducted about eight years ago by the New Baltic company proved a much-faulted and broken formation, with scattered bunches of rich copper ore. Conglomerate 8 is itself mineralized at this point. The maps of the Michigan Geological Survey show a fault running north-northwest (in a direction parallel to that of the known cross-fissure system at Ahmeek and Mohawk) from the northeastern corner of Section 16 through eastern Franklin into southwestern La Salle; also a shorter parallel cross-fault further to the southwest.

The evidence of mineralization in Sections 9 and 16, and the recent discovery of fair copper rock on the Pewabic lode in the Rhode Island section of Franklin, strongly indicate a porphyry intrusion in Sections 15 and 16 which has mineralized a belt of ground following the above-mentioned fault-fissure. The occurrence of a narrow seam of Mohawkite 110 ft. above the first branch of the Kearsarge in Rhode Island drill-hole No. 4, in Section 4, on the line of the fissure, also points to conditions similar to those found at Ahmeek and Mohawk opposite the intrusion. Further development on the Pewabic, Calumet conglomerate, Osceola and Kearsarge lodes north of the 32d-level crosscut at Franklin will prove or disprove the theory as to the existence of commercially profitable deposits at this point in one or more of these well-known beds.



PHOENIX MINE, SHOWING THE PHOENIX FISSURE AND EAGLE RIVER FOLLOWING A BREAK IN THE GREENSTONE FROM SOUTHEAST TO NORTHWEST

In the Ontonagon district, North Lake, situated between important intrusions of felsite-porphyry on either side of the mineral belt, with the deep valleys of the two Fire Steels cutting across the formation, geologically considered, is a promising property. Near the porphyry contact in the eighth-level crosscut to the southeast, entirely in accordance with a geologist's forecast, disseminated copper has been found in rock as saying up to 3½%, or 70 lb. per ton.

Two known cross-faults and Penn Creek indicate that the Cherokee property may be worth exploring. At the King Philip mine, now a part of Winona, the sand-filled valleys of the Sleeping River and its tributaries give such evidence of cross-fissuring as to warrant further development work at depth. The cross-valley of the Misery River holds some prospect of success for Wyandot.

At Contact the streams follow the formation and offer little encouragement. Between Contact and Champion much of the copper belt is covered with a heavy overburden that makes surface indications of little significance. The unusual richness of the rock, together with the occurrence of sulphides and magnetite at the Champion mine, indicates important porphyry intrusions near at hand, perhaps in the much-shattered Globe tract, further south.

It is reasonable to conclude that in early geological ages, before continental ice-sheets moved from Keweenaw Bay westward across the Portage Lake region, the porphyry intrusions along Conglomerate 8' formed a broken range of irregular hills, three of which, Mount Bohemia, Mount Houghton, and Bare Hill, have escaped erosion.

The hard, crystalline greenstone still towers above the other beds along the upper range, giving evidence of a violent volcanic uplift. When the few mineral crests that rise to the outcrops of the master lodes (and coincidently a small number of cross-fissures) were enriched, it is likely that contributing intrusions on the eastern side of the belt stood also above the intervening beds into which the copper-bearing solutions penetrated from two higher sources.

Various theories have been offered to explain the occurrence of native copper with rare sulphides in the Michigan district, in place of the oxides and rich sulphides of the southwest. The difference seems to be one of chemistry; for the fundamental laws of nature, regulating the deposition of minerals, unlike those established by man for the benefit of lawyers, covering questions of apex, are the same in all states.

Future of Cloncurry Field Uncertain

MELBOURNE CORRESPONDENCE

The three principal companies operating on the Cloncurry field, in North Queensland, during 1918 produced approximately £1,250,000 worth of copper, but, notwithstanding this, the future of the district appears to be somewhat uncertain, owing to several causes. First, the distance from the coast, necessitating heavy transport charges; second, the gradual depletion of the richer orebodies; and third, the attitude of the labor unions.

In the course of a serial article in *Chemical Engineering and Mining Review*, S. Harris, of the Mount Cuthbert company, states that there are millions of tons of ore averaging 3 to 5% copper and only awaiting evolution of a scheme for treatment on a large scale. Under present conditions these ores cannot be treated profitably, but he believes that a scheme for handling them must be evolved, if the industry is to be established on permanent lines. To bring this scheme to full fruition, a metallurgical plant would be necessary, according to Mr. Harris. Preferably, but not necessarily, this should be erected in a central situation and be capable of dealing with the classes of ore existing on the field either as separate entities or in combination, to obtain the most profitable results. On the Cloncurry field, Mr. Harris says, every class of ore, from the highly basic to the highly acidic, is found, the latter predominating. Both the oxidized and the primary or sulphide zones are represented. Some of these ores are amenable to direct smelting; others, it is claimed, would require preliminary concentration by wet gravity methods and flotation; and yet another class would be best treated by a leaching process.

Foreign Trade in Lead and Zinc

Imports and exports of lead and zinc, as reported by the Department of Commerce for November, 1918, and the figures for November, 1917, as finally revised, are as follows:

IMPORTS

	November, 1917 Pounds	November, 19 Pounds
Lead:		
Ore, metal contents	2,616,067	1,596,136
Bullion, metal contents	15,870,741	10,602,379
Imported from (in part):		
Canada	610,969	210,527
Mexico	15,986,204	10,939,890
Pigs, bars and old	3,150,251	1,200
Zinc:		
Ore, metal contents	5,272,904	2,199,426
Imported from:		
Canada	496,000	381,591
Mexico	4,776,904	1,817,835
Blocks or pigs, and old	34,878	306

EXPORTS

Lead:		
Pigs, bars, etc., produced from domestic ore	14,688,767	8,806,100
Pigs, bars, etc., produced from foreign ore	2,128,313	7,567,081
Exported to (in part):		
Denmark		111,997
Canada	182,012	39
United Kingdom	8,800,952	15,521,243
Argentina	111,922	224,000
Japan	560,027	66,000
Brazil	134,651	184,532
Italy	1,624,773	224,000
Zinc:		
Dross	3,243,606	2,402,987
Spelter:		
Produced from domestic ore	13,560,834	12,601,780
Produced from foreign ore	2,495,615	2,560,953
Exported to (in part):		
France	2,082,765	1,568,000
Italy	862,084	1,899,612
United Kingdom	12,616,236	7,586,519
Canada	489,195	1,670,377
Mexico	121	300
Japan		1,910,082
In sheets, strips, etc	2,492,353	2,354,823

Paper Driving Belts

Some particulars of the paper driving belts which are now being introduced into German workshops are given in the *Bulletin des Usines de Guerre*, a translation of which appears in the *Compressed Air Magazine*. The paper is cut into narrow bands, which are then spun. The belts are made by weaving or braiding. Woven paper belts are of two kinds—paper fabric and paper thread belts, the former being the more frequently used. The fabric is first cut into bands 40 m. long, which are subsequently made up according to the desired width and thickness. A core of strengthening material is interposed, either cotton or sheet metal, though more recently these cores have consisted of paper thread and metal wires interwoven. The core is surrounded with the paper strips and the whole sewn with strong thread. Belts so prepared are said to be very flexible and to wear satisfactorily. Woven paper belts have a tensile strength of from 100 to 125 kg. per centimeter of width.

The Source of Placer Platinum in the Tulameen District of British Columbia

By R. M. MACAULAY*

Sufficient information has not yet been gathered to prove that the platinum deposits of the Tulameen district of British Columbia can be economically worked. The deposits are large as to extent, but considerable capital would be required to exploit them. The origin of the platinum-bearing rock is found in peridotite and pyroxenite dikes, intruded through the so-called Tulameen group and subjected to some replacement.

FOR several years the demand for platinum has increased more rapidly than production of that metal, with the result that the price has risen steadily. In 1917 the world's production of new platinum was only 83,000 oz., whereas in June, 1918, the United States Government estimated its requirements alone at 69,000 oz. Except for the smaller amounts of platinum obtained as a secondary product from the reduction of other ores, the world's output comes from placers, those of Russia being the large producers.

Exploitation of Platinum-Bearing Ore Has Not Followed Its Discovery

For years the source of the placers has been a subject of study and investigation, and the mother rock has been identified and traced, but no attempt has been made to mine or to work out a system of treatment for the ore, or even to test the rock to ascertain its actual value per ton. The high price of platinum and its recent shortage before the armistice encouraged attempts to mine the platinum-bearing strata which are the sources of the platinum in the placers. Canadian engineers drilled the upper benches of the Tulameen placer beds with the hope of locating pay sands that would give increased production. The district at one time was the chief producer of platinum in America, and it is estimated that 20,000 oz. has been recovered from its gravels since 1885.

Situation of the Tulameen District

The Tulameen district is situated in the southwestern part of British Columbia, forms a part of the Similkameen mining division and consists of about nine square miles, extending from Tulameen Station, on the Kettle Valley R.R., nine miles to the west and two miles north of the Tulameen River and seven miles south of it. Physiographically, it is situated at the eastern flank of the Hope Mountains, and to the north and east lies the interior plateau region of southern and central British Columbia. The platinum placers of the Tulameen River and its tributaries, also Olivine, Lodestone and Grasshopper mountains, on which the platinum-bearing rocks, peridotite and pyroxenite, outcrop, are included in this area.

*Mining engineer, Rossland, British Columbia.

The first explorers were undoubtedly the fur traders and voyageurs of the Hudson's Bay Company, who entered the country by the Okanogan and Columbia River route, which was then the main outlet for the southern interior. Soon after the 49th parallel was fixed as the international boundary, the Hudson's Bay Company opened several trails through the Hope Mountains, and one of these led through Lodestone Mountain and Tulameen Village; but little was known of the district before 1885. Placer gold is supposed to have been discovered about 1852 in the interior of British Columbia, and in 1858 some of the miners coming in from California went to the discoveries on the Fraser River, and a few proceeded up the Similkameen River and worked bars on the lower part of that stream. In 1860 placer gold was found near the mouth of the Tulameen River. The following year the British government built the Dewdney trail across the Hope Mountains into the Similkameen district.

The Tulameen district and the surrounding region were found to be good ranching country, and it was a cowboy who, while ranging horses in the Tulameen Valley in the autumn of 1885, discovered a nugget of gold in the bed of Granite Creek near the Tulameen River. This discovery was followed by a rush of miners and prospectors to Granite Creek and Tulameen, six miles up the river, the following spring, and the river bed was staked from below Granite Creek to several miles above Tulameen. The platinum which was panned with the gold had little value at that time, and was usually dumped back into the stream.

About the year 1898 some prospectors, searching for the original source of the metals found in the placers, discovered high-grade gold-quartz veins, but these were not workable. In 1900 Dr. J. F. Kemp made an examination of the belt of peridotite and pyroxenite which stretches across Lodestone, Olivine and Grasshopper mountains, and reported the rocks to be the source of the platinum. The outcrops have been prospected several times, but the claims were soon dropped.

The best part of the gold placers on Granite Creek and Tulameen River was worked out in the three years following the discovery, but the upper benches were worked by rockers and sluice boxes in a small way for the next 10 or 15 years. The platinum placers produced from 2000 to 2500 oz. a year until 1892, after which it became hard to make wages, and little work was done until the high price of the metal brought a few miners back.

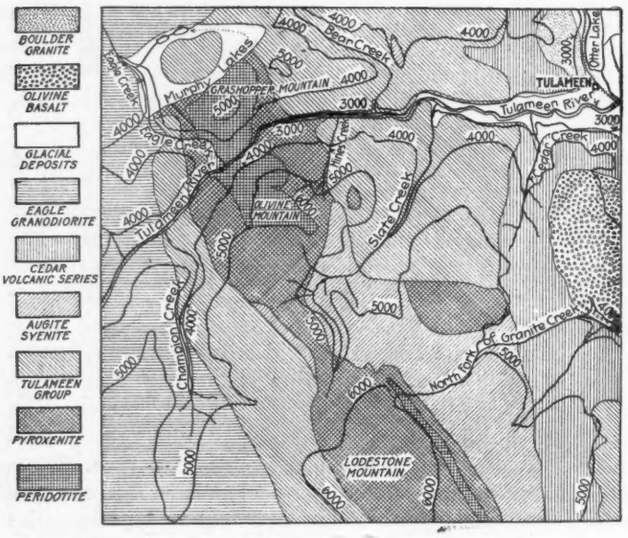
District Is a Part of the Interior Plateau Region

One of the main topographical features of central British Columbia is the interior plateau region, which has its southern limit at about the 49th parallel of latitude at a point southeast of the Tulameen district. From here it extends northward, gradually widening through central British Columbia. At the 50th parallel, which

is the latitude of Tulameen, it has a width of about 100 miles and borders on the Hope Mountains in the west. At this latitude the highest points of the plateau are from 5000 to 6000 ft. above sea level. The streams which traverse this belt have formed valleys, some of which are 4000 ft. deep.

The Tulameen district may properly be described as being a part of the great interior plateau region, but it is situated so near the border that the more typical plateau features are not everywhere highly developed in it, and there is a tendency to the formation of a more rugged type of topography.

The highest point in the district is Lodestone Mountain, with an elevation of 6150 ft.; the lowest point is



SURFACE GEOLOGY OF THE TULAMEEN DISTRICT OF BRITISH COLUMBIA

the bed of the Tulameen River, which is about 2300 ft. above sea level. The mountains have rounded summits with gently sloping sides on the higher levels, but on the lower levels the angle of slope is steep, and cliffs flanked by talus slopes are of common occurrence. The rocks within this area which have resisted erosion are the perodotite and pyroxenite formations. Tulameen district is drained by the Tulameen River, which rises on the eastern side of the Hope Range and empties into the Similkameen River at Princeton.

Oldest Rocks Regarded as of Triassic Period

Underlying rocks are of igneous and sedimentary origin and range from the Triassic to Recent. The oldest formations have been classified as the Tulameen group, and are tentatively referred to as being of the Triassic age. These rocks are mostly of volcanic origin, and, being interstratified with some argillites and thin beds of limestone, are thought to have been laid down under water. The volcanic portion makes up perhaps 90% of the entire group and is prevailingly andesitic in composition. The sedimentaries contain some indistinguishable fossil plants, and have been greatly altered both by regional and contact metamorphism, so that a schistose structure is frequently evident. They dip at angles from 25° to vertical, and cover the largest area of rock formation in the district.

During the period between the deposition of the Tulameen and the Cretaceous groups, mountain building, accompanied by a number of igneous intrusions, took place. These intrusions are referred to the Jurassic period, and have been thrust through the rocks of the Tulameen group in the following sequence: Boulder granite; peridotite and pyroxenite; augite syenite, and granodiorite, all of which are found in various parts of the district in large and small bodies and have a general north and south trend.

Geological Sequence of the Formations

Two conformable Oligocene groups rest unconformably on top of the above-mentioned rock. The lower or Cedar volcanic series, is prevailing andesitic, whereas the upper, or Coldwater group, includes sandstones, shales and conglomerates that lie at angles rarely steeper than 45° and have not been greatly disturbed since their deposition. Intrusive into the Cedar and Coldwater series, and supposed to be of Miocene age, is a body of pink alkaline granite, known as the Otter formation; and lying unconformably on top of these series is a volcanic flow of olivine basalt, which, although of a later period than the Otter granite, is probably of the same age. The basalt is the youngest formation in the district, and still preserves its horizontal position. Stream and glacial deposits cover the floors of all the valleys and much of the higher country.

The Canadian Geological Survey has correlated the rocks of the Tulameen area as follows:

FORMATION OF ROCKS OF TULAMEEN DISTRICT

Period	Special Name of Formation of Group	Character of Rocks
Quarternary		Stream deposits Glacial material
Post-Oligocene probably Miocene		Olivine basalt
	Otter formation	Granite
Oligocene	Coldwater series	Sandstones, shale, and conglomerates
	Cedar volcanic series	Andesites, breccias
Jurassic	Eagle formation	Granodiorite Augite syenite Pyroxenite
	Boulder formation	Perodotite Granite
Triassic	Tulameen group	Volcanic rocks, limestones and argillites

Dikes, which range in character from acid granite porphyries to basic diabases, are numerous throughout the region, but have been intruded in a sequence too intricate to be worked out.

Tulameen Group Subjected to Igneous Intrusions

The oldest of the rocks found on Olivine and Lodestone mountains is undoubtedly the Tulameen group, which has the igneous formations, syenite, peridotite, and pyroxenite, intruded through it. The origin of these three intrusive rocks was probably the same, that is to say, they were thrust up as columns of molten rock to the surface, where they solidified. The peridotite and pyroxenite are closely associated in origin and age, and can be treated as one, and were probably first intruded through the Tulameen group. The syenite contact with the Tulameen group is fairly clean cut, but, with the pyroxenite, it is not always clear; on the contrary, it shows evidences in some places of being intrusive. The close magmatic relation of the syenite to the pyroxenite and the peridotite, as well as the nature of the contacts, gives the impression that the syenite closely followed the pyroxenite and peridotite in time of intrusion. The augite syenite ranges in composition from a true syenite to a gabbro.

There is no sharp contact between the peridotite and pyroxenite. From a pure peridotite, on one side, there is a gradual replacement of olivine by augite, until the olivine is eliminated altogether and the rock becomes pure pyroxenite. This transition covers about 100 ft. in width, although sometimes more than that. Both the pyroxenite and peridotite are cut by small dikes, which fill the cracks formed in cooling and contain both olivine and pyroxene. The area of the pyroxenite outcrop is large, extends across Olivine and Lodestone mountains in a general northwest and southeast direction, and completely encloses the two bodies of peridotite. The formation shows considerable variation in composition and texture, the normal color varying from black to a dark green and the formation containing only augite and magnetite. The latter is usually in small crystals, but it sometimes occurs in large bunches.

The peridotite outcrops in two distinct bodies, the larger one on Olivine Mountain being about two and a half miles in length and varying from one-half to over a mile in width. The rocks are generally well exposed, and the boundary line is fairly closely defined. The peridotite rock contains, besides olivine, some chromite, which occurs either in distinct individual grains or in irregular veins or bunches, and these are found only in restricted areas, whereas the individual grains are disseminated through the entire mass. In the peridotite there is frequently evidence of alteration of the olivine to serpentine, and in some instances veinlets of asbestos have been formed. However, generally speaking and excepting along the contact zone, the mineralogical characteristics throughout the peridotite showing are uniform. The peridotite rock of the Tulameen district is similar to the so-called Russia rock, which is the source of the platinum placers of Russia.

Platinum Occurrences Are in Small Amounts

It has not been definitely determined whether the platinum comes altogether from the peridotite or also from the pyroxenite. Geologists who have studied the occurrences in Russia, at Tulameen, and elsewhere generally conclude that it comes somewhat from both rocks. Platinum never occurs in large nuggets in the Tulameen placers. The largest nugget of platinum of which there is record came from the Ural Mountains and weighed 252 oz., and the largest recovered from Tulameen was probably not over half an ounce in weight. The ordinary nuggets from the Tulameen placers are from one to four millimeters in diameter, and examination is hard to make. Their surface is usually pitted with round cavities, which are often filled with chromite and sometimes contain a little magnetite. Dr. Kemp, in a bulletin of the U. S. Geological Survey, states that he found olivine and pyroxene associated with the platinum in some nuggets, and this probably led to his conclusion that the original source of the platinum was in both the peridotite and the pyroxenite.

Origin of Tulameen Platinum Due to Magmatic Differentiation in Peridotite

Though the pyroxenite contains concentrations of magnetic iron ore in bunches, particularly on Lodestone Mountain, and some copper associated with the magnetite on Olivine Mountain, there is also local concentration of chrome iron ore in the peridotite, but the mineral of economic interest is of course the platinum. The peridotite is undoubtedly the mother rock of the platinum which is now found in the placer of Tulameen River, and those who have been engaged in seeking the source agree that veins and masses of chromite generally contain higher percentages of the platinum than the massive peridotite, which only has fine grains of chromite disseminated through it. This shows that, although it may migrate in solution as do other metals, the platinum is also a product of magmatic differentiation, like the chromite, and has become associated with it.

Chromite Segregations Occur in Outcrops

In chromite-bearing districts, a body of peridotite may show the chromite segregations larger and more abundant toward the outer edge or contact of the peridotite with other rocks, but so far this has not been proved on Olivine Mountain. Segregations of chromite have been found in all parts of the peridotite outcrop, but it cannot be said that these are not the result of apotheses or small dikes from the pyroxenite in the interior of the mass.

I have observed that samples of apparently the purest chromite, when ground fine and placed on a plate, were attracted by the magnet, showing the presence of finely divided magnetite, which could not be distinguished in the sample. Samples from bunches of chromite in the peridotite where no pyroxenite was visible appeared to be as much attracted when treated this way as those from the contact. This might warrant the supposition that pyroxenite is always present where there are concentrations of chromite, even though it does not show on the surface. If it could be proved that some slight concentration of the chromite and platinum has occurred in the zone of contact between the peridotite and the pyroxenite, mining might be attempted, as the body is large.

Sampling of these rocks has been unsatisfactory. Some of the samples which were expected to give the best results showed no platinum whatever, though others ran higher than was expected. The analysis of platinum is difficult to make, and unless the assayer is especially experienced it is hard to obtain accurate results. Samples of the chromite concentrations taken from different places on Olivine Mountain have assayed from a trace to two ounces of platinum, but usually the results vary from 0.01 oz. to 0.05 oz. Platinum assays have been obtained from the peridotite rock from all parts of the deposit, but the best results were from pyroxenite dikes and serpentine veins in the peridotite, and from the peridotite-pyroxenite rock of the contact zone, the assays always being highest where the chromite was the most massive. I have never heard of platinum being obtained in assays of pure pyroxenite.

Commercial Extraction of Platinum Doubtful

A few prospectors in the Tulameen district have devoted their energies to the search for the original source in the solid rock of the platinum of the placers. Although the original source has been known for some time, it still remains to be demonstrated whether or not the platinum occurs in such quantity in the rock as to make its extraction commercially possible. There are few instances in which platinum is obtained in

commercial quantity from the solid rock, and these are usually cases in which it is not the primary mineral sought. The most notable occurrence of this metal in the solid rock in America is probably that at the Rambler mines in Wyoming, where it occurs as the arsenide—sperrylite—in association with a variety of copper compounds, notably covellite. Some lode mining of platinum has been tried at the Key West mine, in Clark County, Nev., where it occurs in 10- to 50-ft. dikes which cut gneisses.

The conclusion of geologists who have studied the platinum-bearing rocks at Tulameen has been that the chances of finding workable concentrations are slight, and that on account of the deep section of these rocks which can be examined on the surface, and because of the fresh condition of the formation, the conditions which would be encountered below the surface would likely be the same as those found on the surface. Then, too, the expense of thoroughly testing the rock, either on the surface or by drilling into it, and the fact that there is practically no precedent in platinum lode mining, and therefore no capital directly interested in it, have discouraged attempting to prove the possibility of mining the formation for platinum.

This will be sufficient to supply the data necessary for guidance in connection with the larger plant, the erection of which is dependent on a satisfactory settlement of the power question.

In view of the fact that it will be considerable time before hydro-electric power will be available for electrolytic treatment on a profitable scale, it has been decided to proceed with the immediate erection of an oil-flotation plant of an initial capacity of about 200 tons per day. The value of this installation will be realized in connection with the working out of the special concentration problems encountered.

Graphite Industry in Alabama

The following is a list of the graphite companies which operated plants in Alabama during 1918, as compiled by W. F. Prouty, of the Geological Survey of Alabama. The list is arranged alphabetically, the post-office address and the situation of the plant being given in each case. It was the intention to publish the table with Dr. Prouty's article "Alabama Graphite in 1918," which appeared in the Jan. 25 issue of the *Journal*, but for unavoidable reasons it was impossible to do so.

GRAPHITE COMPANIES IN ALABAMA

Name of Company	Address	Situation of Plant
Acme Graphite Co	Ashland	3 miles N W of Ashland
Alabama Graphite Co., No. 1 plant	Ashland	5½ miles W of Ashland
Alabama Graphite Co., No. 2	Ashland	6½ miles N W of Ashland
C. B. Allen Graphite Co	Ashland	6½ miles S W of Ashland
American Graphite Co	Gadsden	2 miles N W of Ashland
Ashland Graphite Co	Ashland	4½ miles N of W of Ashland
Atlas Graphite Co	Ashland	8 miles S W of Ashland
Axton-Noe Graphite Co	Ashland	6 miles N W of Ashland
Carbon Mountain Graphite Co	Lineville	Graphite, 2 miles S E of Pyriton, 5 miles N E of Ashland
Ceylon Graphite Co	Birmingham	2 miles S W of Hollins
Clay County Graphite Co	Ashland	Hassell Gap, 2 miles N of Ashland
Crucible Flake Graphite Co	50 Broadway, New York	7 miles S W of Ashland
Crystalline Flake Graphite Co	Ashland	3 miles N E of Ashland
Diamond Graphite Co	Alexander City	
Duro Flake Graphite Co	Sylacauga	6½ miles N W of Rockford
Eagle Graphite Co. (a)	Ashland	7½ miles S W of Ashland
Empire Graphite Co. (a)	Ashland	7½ miles S W of Ashland
Flaketown Graphite Co	Mountain Creek	3½ miles N E of Mountain Creek
Goodwater Graphite Co	Goodwater	1 mile N W of Goodwater
Graphite Company of America	Goodwater	1 mile N W of Goodwater
Griesemer Graphite Co	Ashland	4½ miles W of Ashland
Graphite Mills, Inc	Ashland	2½ miles W of Ashland
Hood-Graves Graphite Co	Alexander City	7½ miles S W of Ashland
Jefferson Graphite Co	Birmingham	6 miles S W of Ashland
Jennings Graphite Co. No. 1 plant	Lineville	2½ miles N E of Ashland
Jennings Graphite Co. No. 2 plant	Lineville	2½ miles N E of Ashland
King Graphite Co	Lineville	2½ miles N W of Ashland
Liberty Graphite Co	Birmingham	5 miles N W of Lineville
Lineville Graphite Co	Lineville	4½ miles N W of Lineville
May Brothers Graphite Co	Ashland	5½ miles N W of Ashland
Monitor Graphite Co	Ashland	3½ miles N of Ashland
National Flake Graphite Co	Ashland	2½ miles N W of Ashland
Norway Graphite Co	Clairmont Springs	3½ miles S of Chandler and 9½ miles W of Ashland
Parkdale Graphite Co	Talladega	¾ miles N E of Parkdale
Peerless Flake Graphite Co	Lineville	4¾ miles N E of Ashland
Pocahontas Graphite Co	Ashland	4½ miles S W of Ashland
Quenelda Graphite Co	Ashland	7 miles S W of Ashland
Republic Graphite Co	Ashland	2 miles N of Ashland
Southern Graphite Co	Ashland	2½ miles N W of Ashland
Southern Star Graphite Co	Ashland	5 miles N W of Ashland

(a) Plant Burned in 1918.

Mount Read & Roseberry Mines

The directors' report and statement of accounts for the year ended Sept. 30, 1918, for the Mount Read & Roseberry Mines, Ltd., of Tasmania, says that a parcel of 110 tons of ore was purchased during the year by the Anaconda Copper Mining Co., and treated at its Great Falls electrolytic zinc plant, payment being made for the zinc, lead, silver, and gold contents. The opinion was then expressed that the ore was exceptionally suitable for that method of treatment. E. R. Crutcher, formerly of the staff of the Anaconda company, is now engaged on preliminary laboratory research work at Queenstown, Tasmania; and it is purposed to install an experimental plant, with a daily capacity of about one ton of metallic zinc, as soon as possible.

Canadian Mining Law

Speaking at the annual general meeting of the Canadian Mining Institute, A. W. G. Wilson said:

"The codification of existing mining laws, and their amendment where necessary, will have to be considered. It may appear desirable to so amend existing laws that the country may be assured that in the future the control of important mineral resources shall be vested only in the hands of residents of Canada or subjects of the British Empire. This action has been taken with respect to natural gas and petroleum resources, and it may be desirable to extend it to other similar resources that are essential for military purposes or to enable Canada to secure and maintain commercial independence. Such legislation is in force in other countries."

Utilizing Volcano Steam

The utilization of volcanic power is a new industrial exploitation which is being made in Italy. According to *Italian News Service*, the present enormous price of coal has led to the development of this manner of securing heat.

The first experiments were made some years before the war by Prince Ginori-Conti, in Tuscany, at Larderello, near the salt mines of Volterra, a region extensively covered with volcanic formations, the most wonderful being the so-called "soffioni," which are certain volcanic vents omitting powerful jets of hot steam containing boric salts and various gases used in the extraction of boracic acid.

In 1905, Prince Ginori-Conti applied this natural steam to a 40-hp. engine, using only a small section of the Nenella fissure, which is the most powerful "soffione," the steam ejected having a pressure of five atmospheres. The results obtained during several years of experimentation were satisfactory, so that he continued to make larger and deeper borings, measuring the force of the steam ejected. Combined, this force could operate engines of many thousand horsepower. In 1912 an experiment was made, wisely on a more modest scale but sufficient in scope to obtain conclusive results, for which a 300-hp. turbine-alternator was used. Later, because of the enormous increase in the price of coal, the prince decided to exploit the thermic energy of these "soffioni" on a much larger scale, but as other substances are emitted with the steam, among them sulphuric acid, which corrodes metals, particularly iron, and therefore the pipes in which the steam was to be collected, he attempted to use this steam only for heating. Three turbine-alternators of 3000 kw. each were installed, fed by boilers at low pressure not heated by coal or other combustible fuel, but by the natural steam, superheated to 165° C., issuing from the "soffioni" and piped and carried to the boilers.

Today the works at Larderello have a central plant of 16,000 hp. operating without interruption and distributing current to Florence, Livorno, and Grosseto, and its capacity is soon to be increased.

The Ruck Zinc-Distilling Furnace

The accompanying engravings are interesting as illustrations of a recent type of distilling furnace introduced at the works of the English Crown Spelter Co. by E. Ruck, general manager of that company.

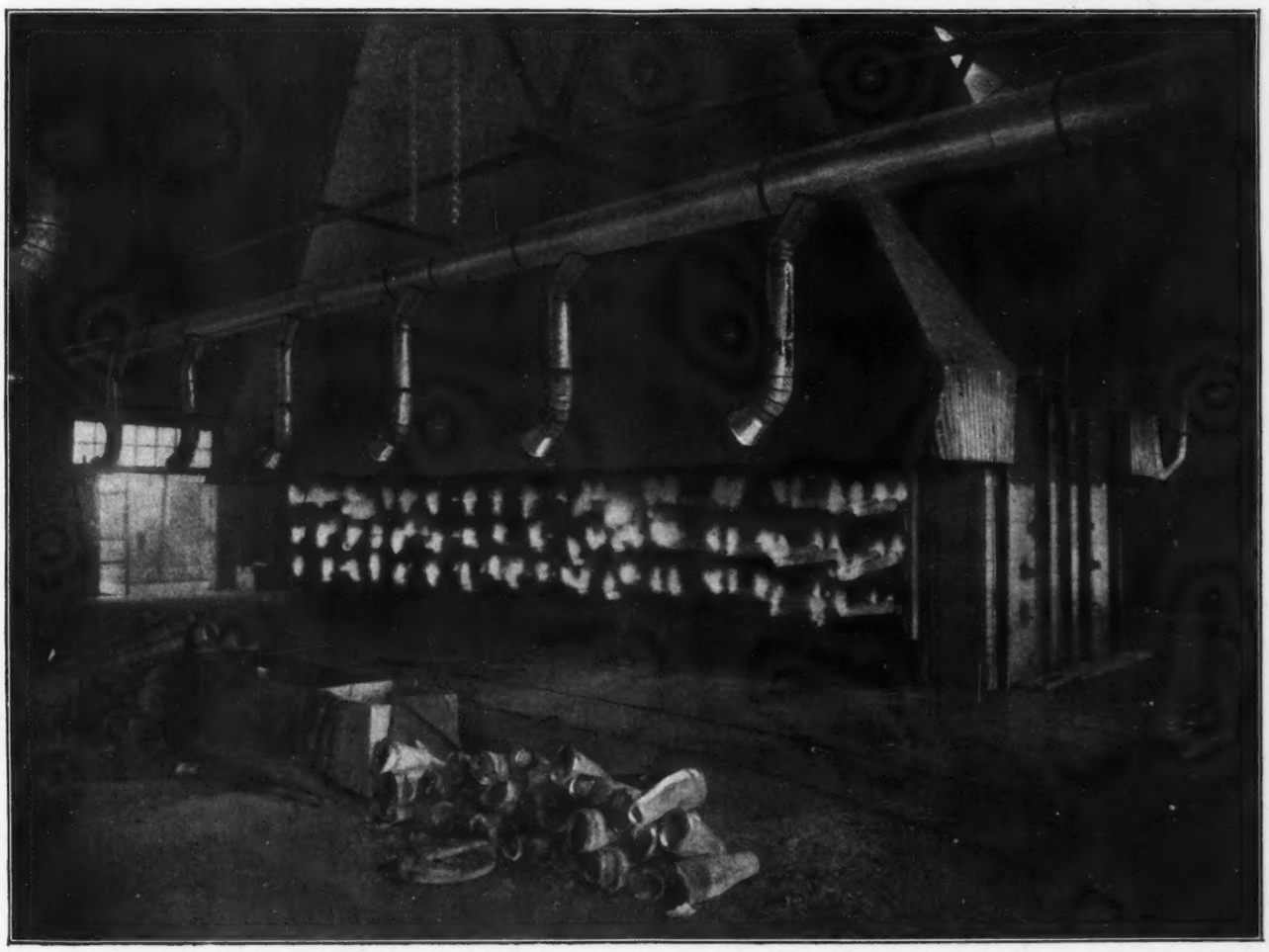


FIG. 1. GENERAL VIEW OF RUCK REGENERATIVE ZINC DISTILLING FURNACE

The specially interesting feature of this furnace is the provision of gas and air conduits in the front wall of the furnace, which is intended to improve the heating of the front ends of the retorts. It will be noticed, furthermore, that while the general lines of this furnace are of the Rhenish type, the front ends of the retorts are broad pretty nearly to the face of the furnace, as in the ordinary Belgian type.

Referring to the drawing, *A* shows the air regenerators, and *B* the gas regenerators. Part of the hot gases from the regenerators pass upward over the retorts *C*, *D*, *E*, through passages at *G*, while the front ends of the retorts in the second tier are heated by the gases passing through the flues *H*, *J*, in the direction of the arrows. These passages, it will be noted, have outlets in the neighborhood of the front ends of the

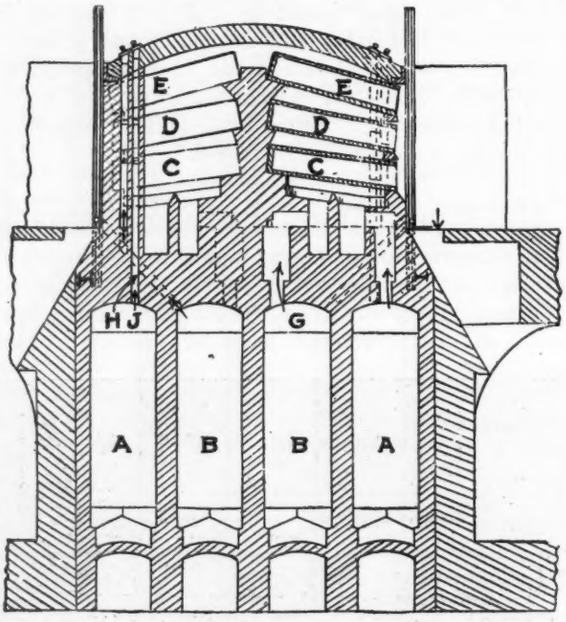


FIG. 2. TRANSVERSE SECTION OF RUCK FURNACE

retorts. Suitable provision is made for cleaning the flues, the openings being normally closed with bricks in the usual manner.

In the distillation of 754 tons of ore, averaging 46.54% zinc, the coal consumption was 1.15 ton per ton of ore, which was considered to be materially better than the results obtained by the older furnaces in the same works.

Canada's International Relations*

Canada is economically dependent on other territories. We lack many commodities essential to commercial independence, such as supplies of raw sulphur, iron, coal, and other materials. We are dependent on outside sources, in part foreign, for much of the iron ores which are converted into pig iron and steel in our blast furnaces. We produce no anthracite coal. Central Canada, in which is nearly one-half of our population, and about one-half of our manufacturing industries, is, at present, directly dependent on the United States for winter fuel, and for steam power. The coal fields of eastern and western Canada could not be developed sufficiently to enable them to replace this foreign fuel supply in less than three years' time, were that supply suddenly withdrawn. Fuel supplied from these fields would not be so satisfactory to the consumer and would cost much more. Our present house-heating appliances are not adapted to using this type of fuel, and the people would experience difficulty in learning how to use it properly. Our present transportation systems are not capable of handling the additional traffic that would develop, and would have to be expanded. This expansion would be costly and would require considerable time for effective development.

On the other hand, the United States is practically dependent upon Canada for nickel, asbestos, and for certain other materials. An extensive trade has been developed between the two countries in both raw and manufactured mineral products. The most important electro-chemical industries of the continent are situated at Niagara Falls, on both sides of the international boundary, and are dependent on the electrical power generated there. We are reported to possess material reserves of potential power, a portion of which we will be able to exchange for essential commodities that we do not possess, or which are not at present convenient of access. Eventually we will probably control the supplies of coking coals and the byproduct coke industry of the continent. International relations arising from these conditions will need consideration, preceded by accurate investigation, some of which is now in progress.

At present about 80% of the nickel industry, approximately 90% of the copper industry, a percentage of the iron and steel industry, and nearly the whole of the heavy chemical and fertilizer industry, and portions, or the whole, of many other industries, are controlled by citizens of the United States, and many of the head offices of the companies concerned are situated outside of Canada. The same is true of many minor industries. In a number of cases the control of the greater portion of the raw materials now produced, and which would be required by industries not now established in Canada, is in foreign hands. At the present time a copper refinery owned by citizens of the British Empire would be almost wholly dependent for its supply of raw material in the form of blister copper (90-98% pure) on the product of mines and smelteries owned by foreigners. The same is true of nickel, sulphuric acid, nitric acid, hydrochloric acid, and many other products.

This condition of affairs gives rise to several problems, the most important of which involve the consideration of ways and means to persuade or compel the foreign owners of basic industries to produce finished products in Canada.

*Abstract from A. W. G. Wilson's address at the Annual General Meeting of the Canadian Mining Institute, March, 1918.

Copper Economy in Telephone Work*

The reduction, which has been found practicable, of the size of the wire and the weight of copper required in the transmission circuits of telephone companies not only greatly reduced the cost of material, but made it possible to use, in the underground conduits, cables with as high as 30 times the number of circuits for which they were originally intended. When it is considered that there are over 20,000,000 miles of copper wire in use, and that the reduction in weight is from one-half to even one-quarter of what was formerly needed, the saving can be appreciated. And when it is realized that the underground conduits for the telephone cables have cost over $100,000,000, some idea of the saving in construction through increased capacity can be formed.

*Abstract from a letter from Theo. N. Vail to the Hon. John A. Moon, chairman, Committee on the Post Office and Post Roads, Washington, D. C.

Concreting Prospect Drill Holes

BY ROY H. POSTON*

In the Southeast Missouri lead district the formations are such that exploratory drill penetrations through the strata often form channels for underground water, and this condition imposes a serious handicap in mine pumping operations. The practice of plugging the openings with concrete has proved successful in stopping the flow. Three examples illustrating how this was done under different conditions are given.

PROSPECT drill holes sunk from the surface frequently penetrate crevices, fissures, channels, or porous-rock areas that serve as passageways for water in its downward course to subterranean stream or reservoir, and occasionally such drill holes are directed into or through the reservoir itself. If the bore hole is cut below this water reservoir or stratum, by an underground stope or drift, the water diverted by the hole from its natural course flows directly into the mine, thereby throwing an unnecessary burden upon its pumping facilities. The flow of water may often be stopped before it enters the mine by inserting a wooden plug in the bore hole, but this is not always possible, because of varying conditions such as the height of the mine roof, and the velocity of the flow of water; and other methods must be employed.

Determining the Water Channel in a Drill Hole

An effective and inexpensive method of curtailing flows from the sources mentioned is to concrete the bore hole either from top to bottom or across the offending channel or water supply. The position of the channel may be determined by lowering a small piece of wood, suspended from an ordinary cord, into the hole until the "pull" on the string indicates that the channel has been reached, the "pull" being easily perceptible if the water is still flowing from it. The measurement of the string then determines the channel with respect to the collar of the hole. A standard cement is used in the ordinary proportions required for concrete foundations and walks, but it is essential that the mixture be made thin enough to facilitate pouring into a hole of small diameter, and lumps or small rocks that would be permissible in other kinds of work must be eliminated.

Marking the Position and Plugging the Drill Hole

Diamond-drill holes in the Missouri districts vary from 1¼ in. to 4 in. in diameter, and occasionally are larger, and they are consequently easier and less expensive to concrete than churn drill holes, the diameters of which are commonly 6 in. or more. Before starting a bore hole, a short piece of iron pipe, slightly larger in diameter than the gage of the drill bit, is set in solid rock and firmly wedged into a vertical position by means of wooden wedges, the procedure being known to drillers as "corking." This pipe, usually known as the "sleeve," projects several inches above the ground, and serves as a guide for the drill bit when beginning the hole. When the hole is fathomed, or finished, this sleeve pipe is usually left in position, to mark the exact situation of the hole for future reference. It should immediately be plugged to keep mischievous boys, surface drainage, or other agencies from clogging or filling it with debris. The plugging requires little time and trouble, and should be insisted upon by every drill foreman, for it is usually quite a task, if not entirely impossible, to clear a hole of accumulated material if it has been left open for any length of time. A cheap and efficient method of plugging a diamond-drill hole has already been described[1].

Hole Must Be Clear Throughout Entire Length

After ascertaining the depth of the hole from the drillers' log or other source, the first step is to make sure that the hole is absolutely clear for its entire length. One method of doing this is by lowering an iron weight into the hole. The weight should be about

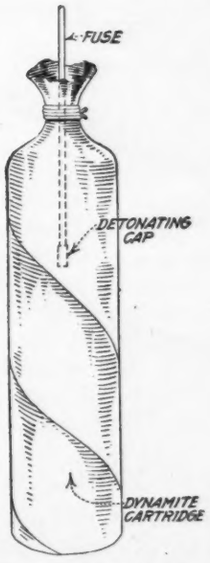


FIG. 1. DYNAMITE CARTRIDGE PREPARED FOR USE IN DRILL HOLES

12 in. long, weigh 3 or 4 lb. and be slightly less in diameter than the bore hole. One end should be pointed, and a small hole made in the other allows the insertion of a strong steel wire. Small rocks, pieces of core, and other similar obstacles may be forced downward by pounding carefully with the weight, as the pointed end serves to break up and dislodge the pieces. If a particularly stubborn obstacle is encountered that will not yield to the hammering of the weight, a small charge of dynamite exploded thereon will usually force it down, but this practice is not to be recommended except as a last resort, as the character of the rock in the vicinity of the shot may be such as to fill the hole with loose particles of rock broken by the shot itself. Usually one-third or one-half a standard stick of dynamite will

*St. Francois, Missouri.

[1] *Eng. and Min. Journ.*, June 9, 1917, p. 1026.

serve the purpose, and it may be prepared for firing as shown in Fig. 1, this being, in my opinion, an excellent method, as it presents no projections to catch the sides of the bore hole in its descent.

Care must be taken in lowering the weight into a hole, as water flowing from side channels or crevices may sometimes dam up on top of the weight and cause enough extra strain to be thrown on the wire to seriously inconvenience the operator. For this and other reasons the wire should never be allowed to play out over the sharp edge of the sleeve pipe, but should be placed over some round object, such as a pick or shovel handle, to prevent unnecessary kinks or the shearing of any of the metal in the wire on its passage into the borehole.

When the hole has been cleaned throughout its entire length, the lower end, if open, is plugged to retain the concrete when it is poured. This may be done in various ways and depends on existing conditions. If the hole is cut underground by a drift or stope, and the back is accessible, a wooden plug may be driven into the hole, but if the roof is too high to reach, or the mine is filled with water, other means must be employed.

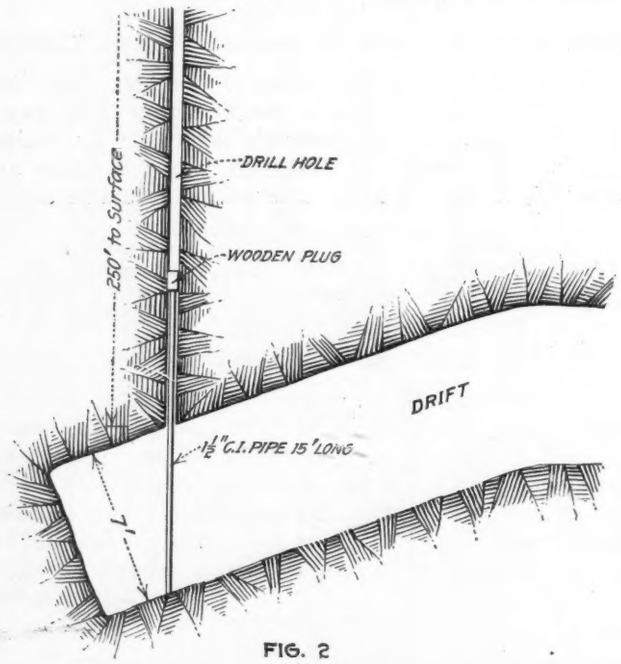


FIG. 2

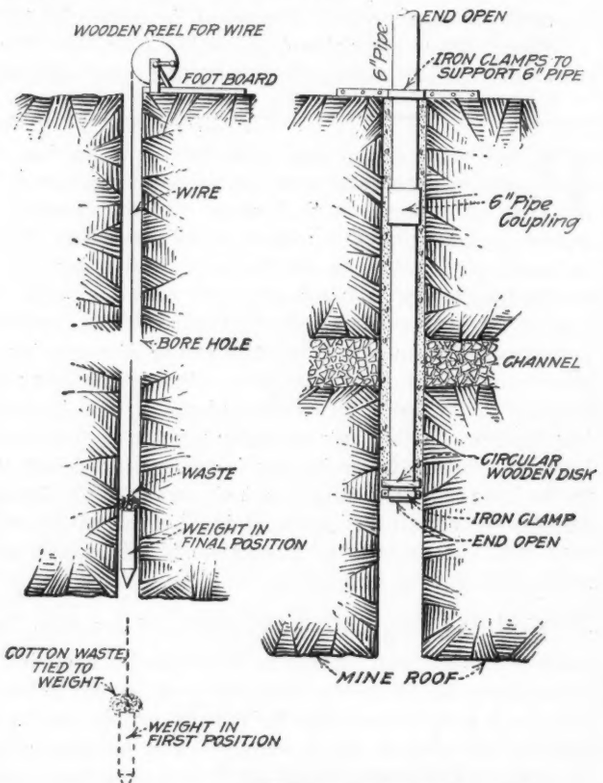


FIG. 3

FIG. 4

FIGS. 2, 3, AND 4 SHOW METHODS USED IN THE SOUTHEAST MISSOURI DISTRICT IN CONCRETING DRILL HOLES

Methods of Plugging Drill Holes

Fig. 2 illustrates a method employed when a drift was filled with water and the hole was therefore inaccessible. Fig. 3 shows a method used to plug a drill hole cut by underground workings where the roof was inaccessible, but could be seen by means of a strong light. In this instance, the weight was first lowered through the hole into the mine-working to an assistant, who tied a piece of ordinary cotton waste securely to the top of the weight. The waste forms a tight sleeve or "pack" around the weight, so that when it is drawn into the hole from above, the opening is completely filled and ready for concreting. The wire should be securely fastened to some solid object near the collar of the hole, and must be of sufficient strength to sustain the weight of the concrete in the hole until the mixture has set. In this method, the weight employed should be different from that used to clear the hole of obstacles and should have a square top or shoulder to provide better support for the concrete to rest upon. The wire should be of steel and of sufficient tensile strength to hold the load, which will depend on the diameter and depth of the hole. It should be free from all bends and kinks, and preferably should be in one piece, but if it becomes necessary to splice, the work should be carefully done. After cementing, the wire must not be untied from the support on surface for at least 48 hours.

Fig. 4 illustrates a method of concreting a churn-drill hole, in which it was necessary to shut off the flow of water from nearby channels and at the same time to leave the hole open to provide ventilation for a stope. A piece of pipe of a diameter 4 in. less than that of the hole was fitted at one end with a pair of iron clamps that could pass freely into the hole. A wooden disk was placed above the clamps and served as a base for the concrete. When in place the pipe was supported on the surface by means of clamps.

I know of one instance where it was impossible to find the collar of a certain hole on surface and it became necessary to plug the hole from the underground workings. This was done by filling standard 1½ in. x 6 in. tamping bags with wet concrete and pushing them up into the hole, one at a time, using a short section of pipe. When no more concrete could be forced into position, the hole was plugged by means of a soft pine stopper that had previously been soaked in water. This plug soon ex-

panded and held the concrete in position until it had set. Other conditions may be encountered in the work of concreting drill holes, and these must be met by the experience and ingenuity of the man in charge of the work. As only a small batch of concrete is necessary for each hole, it is usually mixed by hand by the side of the hole to be sealed. All the necessary material and paraphernalia for the work may be easily loaded into a one-horse wagon and transported from hole to hole with little loss of time or inconvenience.

Discharging Water From Mining Plants

BY CHESLA C. SHERLOCK*

The pollution of streams by mining operations has already been discussed[1]. In the present paper those cases will be considered where the mine operator or owner has discharged water or other substances from his mining property so that it will flow over the land or property of another in obedience to the law of gravitation.

In the former discussion those principles of law regarding the rights and obligations of riparian owners in respect to such matter as might be brought from the mine and discharged into the stream were pertinent. But the courts are agreed that the principles governing riparian owners do not apply in instances where water is taken from a subterranean course, brought to the surface, and discharged so that it will flow, according to the lay of the land, upon the property of another.

Riparian rights are something which are acquired with notice by the man who buys land adjoining a stream; and the existence of the stream is notice to him that he must accept the rights of a mere riparian owner. He cannot exercise any other right in such an instance, because if he did so he would be in a position to cut off the rights of the owners of other land facing the stream who might be below him. But when the owner of land is not located upon the course of a stream, even though his land is below that of a mine owner, entirely different principles of law apply in case water is discharged from the mine so that it will enter his land and do damage to it.

When a man buys land which is lower than adjoining land, he takes it with notice that he cannot hold the owners of the higher land liable for such water as may flow on his property by natural drainage, but the mere fact that he is bound to accept the water flowing by natural drainage from the land of another does not give the owner of the higher land the right to alter this flow or to increase it so as to add to the reasonable natural flow of water upon the land of the lower owner.

In other words, so long as the water flowing onto the land of the lower owner is the result of natural drainage, the said lower owner cannot complain; but if the water flowing onto his land is the result of artificial means or methods adopted by the higher owner, then he has some rights which he may assert.

Even though there is a natural drainage of considerable water onto the land of the lower owner, no principles of riparian ownership apply; and, even if water is flowing with more or less regularity upon the land of the lower owner, the mine owner has no right to change its character by adding to its content any other substance taken from the mine, nor has he any right to add to its volume by adding pure water to it, without incurring liability.

This does not mean that the mine owner whose mine is located at a higher point has no right to discharge water or other substances upon his own land. He has that right beyond the shadow of a doubt, and the lower owner cannot prevent his so doing, but the liability of the mine owner begins when such substances or water pass from his own land onto that of another.

The mine owner may not be held liable, either, in case the discharge of water upon his own land subsequently flows upon the land of another, but does no damage. This decision was reached by the South Dakota court, holding that the lower owner had no right to enjoin the work of the higher owner when such flowing of water across the former's land did him no damage.

If the mine owner can, by "slight expense," prevent the water which he discharges from his mine or other operation from doing the lower land owner any damage, he is legally bound to exert such means and spend the money necessary to prevent such damage being done. But, said the Pennsylvania court, if this expense would consume all the profits of the mining operation, then it is clearly unreasonable to hold the mine owner to such a duty.

The court said: "If the expense of preventing the damage from his act is such as to practically counterbalance the expected profit or benefit, then it is clearly unreasonable and beyond what he could justly be called upon to assume. If, on the other hand, however large in actual amount, it is small in proportion to the gain to himself, it is reasonable in regard to his neighbor's rights, and he should pay it to prevent the damage, or should make compensation for the injury done. Between these two extremes lies a debatable region where the cases must stand upon their own facts under the only general rule that can be laid down in advance—that the expense required would so detract from the purpose and benefit of the contemplated act as to be a substantial deprivation of the right to the use of one's own property. If damage could have been prevented short of this, it is injuria which will sustain an action."

The mine owner's liability might be expressed in another way, as it was explained by the Louisiana court. If a man buys lower land he is bound in statutory servitude to receive the natural drainage of the higher land, provided that no agency of man has been used to make that servitude more burdensome to him. But if the mine operator takes water and other substances out of his mine and discharges it upon his own land, then he is bound to confine it there; or to so care for it that it will do no injury to the land or property of another. It was held that the burden to perform this duty is assumed by the mine owner or operator as soon as he brings water or other substance to the surface and discharges it upon his land, having notice in advance that it will naturally seek the lower level and reach the land of another.

In Maine it was said that the mere fact that one has conveyed land to another with knowledge that it is to be used for a slate quarry will not estop him from demanding damages due to the discharge of water

*Box 84, University Place Station, Des Moines, Iowa.

[1]*Eng. and Min. Journ.*, Nov. 16, 1918, p. 861.

and rocks upon his own land. There the mere fact that the plaintiff had granted the quarry to another cannot be taken to confer the right upon the owner of the quarry to make an illegal use of it so as to injure the grantor. Nor was the conveyance to be regarded as a waiver of damages in working the quarry, even though the grantor knew that it was to be so used by the purchaser.

A California case was based upon slightly different facts. The mine owner caused water to flow over the land of another, when it was shown that it would not naturally have flowed over his land, in obedience to the law of gravitation. The court held that the owner of the lower land was entitled to an injunction to prevent further damage, and to damages for the injury already done, if it was shown that the circumstances did not authorize or justify the mine owner to cause the water to so reach the land of the lower owner.

In another California case the court said that the rule is general that when one brings a foreign substance on his land he must take care of it, and not permit it to injure his neighbor, even at expense to himself. The facts in this case showed that only slight expense was necessary to prevent injury to the neighboring land.

In a Pennsylvania case, it was held that if an upper land owner, by pumping, increased the amount of water which would naturally flow upon the land of another, and, by artificial means, concentrated it at one point, that he was *prima facie* liable for damages.

In an Indiana case, the mine operator admitted that he had pumped water from his mine so that it would increase the natural flow upon the lower land owner, but attempted to justify such action upon the ground that it was only the reasonable consequence of his right to the use and enjoyment of his own premises. The court held that the question of whether he had been guilty of negligence in so acting was one for the jury to determine.

In another Indiana case, it was contended that the increased flow of water was only the consequence of a reasonable use of the land in carrying out the mining operations, and therefore justifiable. The court said that while lower land is servient to the natural drainage flow of higher land, and such reasonable contamination as might occur in a reasonable use of said land, yet the lower land is not servient to unreasonable artificial flowage, and if the injuries could have been prevented by the mine owner at inconsiderable cost to himself, as the evidence seemed to indicate, then he was liable therefor.

The Licensing of Engineers.

The question of the licensing of engineers has been taken up by the Engineering Council, and a License Committee has been appointed with the following members: Chairman, T. L. Condron, Chicago, Ill.; F. C. Shenehon, Minneapolis, Minn.; Farley Gannett, Harrisburg, Penn.; John H. Dunlap, Iowa City, Iowa; Arthur M. Greene, Jr., Troy, N. Y.; Caleb M. Saville, Hartford, Conn.; James H. Herron, Cleveland, Ohio; A. M. Schoen, Atlanta, Ga.; John Klorer, New Orleans, La.; Philip N. Moore, St. Louis, Mo.; A. Lincoln Fellows, Denver, Colo.; C. H. Snyder, San Francisco, Calif.; and Amos Slater, Seattle, Washington.

The country is being divided into districts by the chairman, to be assigned to the various members of the committee for the gathering of information from state officers, and others, relative to existing and proposed legislation on the subject of licensing engineers and architects. The committee is already receiving inquiries for information and assistance on this subject.

Safe Cyanide Fumigation*

By T. O. Smith

Hydrocyanic acid gas is one of the most important fumigants, but its application is attended with considerable danger in the hands of one not thoroughly familiar with its properties. A simple device for using it with safety is here described.

The lines shown in the accompanying cut represent the walls of a room or the sides of a box in which the articles to be fumigated are placed. *O* is a hole through which a cord connects the apparatus with the operator on the outside. A large beaker is placed in

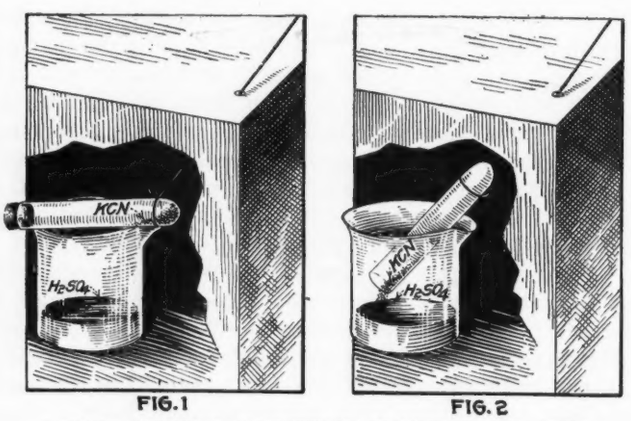


FIG. 1 FIG. 2

A SAFE METHOD OF MIXING CYANIDE AND ACID

the proper position with regard to the articles to be fumigated and the required amount of dilute sulphuric acid poured into it. The exact amount of potassium or sodium cyanide is then weighed into a test tube and a cork inserted. The cord which extends through *O* is tied around the bottom of the test tube. The tube is then placed across the beaker with the bottom resting on the lip as shown. The lip of the beaker prevents it from rolling off. When everything is in readiness the operator removes the cork and, stepping away from danger, pulls the cord. This causes the test tube to fall into the position shown in Fig. 2, dropping the cyanide into the acid. In this manner hydrocyanic acid gas may be generated in any desired concentration, without danger to the operator.

American Zinc Products Company's Rolling Mill —Erratum

In our issue of Nov. 2, 1918, in describing the zinc-rolling mill of the American Zinc Products Co., at Greencastle, Ind., it was stated that it had a daily capacity of from 1000 to 1500 tons of zinc plate and sheets. This was an error; the figure given represented the *monthly* capacity.

*Abstracted from the *Chemist Analyst*, Dec., 1918, p. 18.

Linking Up Isolated Mineral Districts by the Loco.-Tractor Transport System*

By FRANK DUTTON

The problem of the opening up of isolated mineral districts in non-mountainous regions, where a heavy initial outlay would be unjustifiable, is usually complicated by the inefficiency and slowness of animal transport over rough roads, the comparatively high cost of ordinary tractors, and the limitations in the matter of locomotive size and weight in connection with light railways. The new system to be described uses trucks running wholly on light rails. The loco.-tractor, which takes the place of a locomotive, is shod with solid rubber tires, which run on prepared strips of road metal on each side of the railway track, but a guiding portion runs on the rails. The practical advantage of the system will be obvious, particularly with reference to the large increase in haulage power obtainable.

IT HAS been said that transport is the essence of civilization, and it is everywhere realized that the prosperity of a country is largely determined by the extent of its transport facilities.

Science has provided and developed, to a high degree of perfection, the wonderful system of steamships and railways. These, however, are in the nature of arterial lines of communication. There is, nevertheless, a serious "missing link" in the railway system as at present evolved. This missing link is the transport service required to open up and develop agricultural and mineral districts, and so connect them to the arterial railways and the markets of the world. This problem is not a new one; indeed, it is one of the oldest, and yet no solution has as up to now been evolved that has found general acceptance or wide application.

Development Needed in Pioneer Railway Service

Railway development during the last 20 years has all been in the direction of higher speeds, heavier trains and locomotives, and heavy track. The development in the reverse direction for pioneer railway services has been practically at a standstill. In the system to be described the problem of the light railway for development services has been approached from an entirely fresh standpoint, and the solution adopted will be found not only a means of overcoming all the technical difficulties in cheap railway construction at less than one-third the cost of the cheapest branch railway, but practically as cheap as a hard road.

If it is possible to apply suitable motive power to a train running on a railway built with rail sections of 16 lb. per yard, gradients 1 in 20, and curvature of 50-ft. radius, then the question of cheap railway construction would appear to be in a fair way to being solved.

The results obtained and tests made with a rubber-tired road tractor put me in possession of facts that I had not previously seen recorded, and which apparently have escaped the attention of those interested in mechanical traction. This experience led to the design of a loco.-tractor—a special form of machine that is intended to take the place of the locomotive on pioneer light railways. The loco.-tractor will operate satisfactorily on a railway line built to the specification already noted. A railway to this standard could be built at

THE LOCO.-TRACTOR LIGHT RAILWAY

one-third the cost of the cheapest branch railway, and even for much less than the cost of a first-class road.

The loco.-tractor system is based on the two following fundamental principles:

1. The low tractive resistance of vehicles running on rails, as compared with the high tractive resistance of vehicles running on roads.

Tractive resistance per ton:

Vehicles on rails, 6 to 20 lb.
Vehicles on roads, 56 to 200 lb.

2. The high tractive effort obtained by using solid rubber-tired driving wheels running on roads, as compared with the low tractive effort of locomotives running on rails.

Tractive effort per ton of axle load:

Solid-rubber tires on roads, 1330 lb.
Locomotives on rails, 344 lb.

Trucks Run on Rails; the Tractor Runs on the Road

To take advantage of these valuable properties, the loco.-tractor system uses trucks running wholly on rails, thus securing the greatest possible efficiency in utilizing power for hauling purposes. The guiding portion of the loco.-tractor also runs on the rails, but the driving wheels, shod with solid-rubber tires, run on prepared strips of road metal on each side of the railway track. Thus, for a given horsepower and weight, the hauling power is four times as great as with ordinary locomotives. The three principal reasons why railways can be constructed cheaply on the loco.-tractor system lie in the facts that sharp curves, light track, and steep gradients can be used.

*Abstracted from the *South African Journal of Industries*, Aug., 1918, p. 1089.

First, as regards sharp curves: As there are no coupled driving wheels on the loco.-tractor, and as the driving axle is fitted with a differential, very sharp curves can be negotiated without risk of derailment or loss of power, or fear of damaging the track. Curves of 50-ft. radius offer no difficulties whatever, thus facilitating cheap construction in difficult country and enabling the railway to pass through villages or pass cultivated areas without demolishing buildings or expropriating valuable land.

Second, as regards light rails and sleepers: As already stated, only the guiding portion of the loco.-tractor is carried on the rails, and, as this weight is small, a rail heavier than 16 lb. per yd. is unnecessary. No matter how heavy or powerful the loco.-tractor used may be, a heavier track than 16 lb. will never be required, as the heavy driving portion of the loco.-tractor runs on the special wheelway and not on the rails.

Third, as regards gradients: The high tractive effort obtained by means of the solid rubber-tired driving wheels can be turned to full account by introducing gearing between the engine and the driving wheels. This combination gives a powerful draw-bar pull for starting and when running at low speeds. The gradient used, therefore, is almost a matter of indifference, but it is recommended that, wherever possible, the ruling grade should not be steeper than 1 in 20. The high starting tractive effort of the loco.-tractor enables it to start with a full load on a 1-in-14 grade, with all trucks hanging on the couplings without jerk or strain. This is impossible with the ordinary type of locomotive. A further advantage of the system is that the trouble experienced with wet or greasy rails is entirely obviated.

Trial of System Gives Good Results

A trial of this system was authorized by Sir William Hoy, and a test section has been laid down on the veld at Canada Junction, near Johannesburg, South Africa. As the general manager's instructions were that the test should be a severe one, grades and curves were accordingly incorporated in the test track that would never be encountered in actual practice. The rails and sleepers were not ballasted, but just laid on the gravel and dirt found on the site. The wheelways for the driving wheels were comprised of the same material, and received no preparation whatever, beyond the pressure of the wheels of the loco.-tractor running over them a few times. Other difficulties were introduced, such as putting the super-elevation on the wrong side on curves, using crippled second-hand track, omitting check rails on curves, and similar modifications. The curves are of various radii, the sharpest being 37-ft. radius, and a balloon curve of 50-ft. radius forms part of the line.

As regards gradients, fairly long grades of 1 in 17 and 1 in 18 are used on the straight, though there is a grade of 1 in 18 on a 100-ft. curve. This is equivalent to a grade of 1 in 14 on the straight.

The rails used were the ordinary mine-track type, weighing 16 lb. per yd., with the usual light-steel sleeper weighing about 6 lb. The loco.-tractor, as will be seen in the illustration, is a rubber-tired road tractor which was converted for use on the trial railway. The only alternation that was made was in fitting the front axle with a ball socket, so that a four-wheeled rail bogie may support the front portion of the loco.-tractor, instead of the usual steering wheels. The latter are raised up clear of the ground when the loco.-tractor is running on the railway. The weight of the loco.-tractor is so distributed that 3000 lb. rests on the rails and 5655 lb. on the driving wheels.

The Loco.-Tractor Is Quickly Convertible

The loco.-tractor can, in a few seconds, be converted from road to rail, or vice versa, so that the utility of the machine is exceptional. It is as serviceable on the road as on the rail, without any alteration whatever. The tractor is fitted with a 35-hp. engine using kerosene as fuel. The rear axle is driven by a worm drive, and it is believed that this is the first instance where the worm drive has been used as the final drive for traction purposes. The driving wheels are particularly large, being 4 ft. in diameter, and the twin rubber tires are 5 in. wide. One of the most remarkable features of the test was the accuracy with which the driving wheels aligned themselves to the setting of the steering bogie on the rail track. No matter how many times or in which direction the loco.-tractor ran over the course, the driving wheels followed the same "spoor" exactly. The trucks used on the trial were high-sided bogies with a floor space 16 ft. long by 5 ft. 6 in. wide. The test load of 16 tons was made up with railway sleepers.

Speed Attained Exceeds Expectations

In view of the adverse conditions of the test, and also of the fact that the track was composed of crippled and bent rails, it was thought that only low speed would be possible, but it was found that the loco.-tractor rode easily at 18 miles an hour and took the 50-ft. curves at 12 miles an hour with perfect steadiness. Attempts were made to derail the loco.-tractor on the sharp curves, and excessive speeds were run, but it was found impossible to cause a derailment.

The loco.-tractor could stop and start with a full load on any grade or curve on the trial track, without any jerking or slipping, and this with the full weight of the train hanging on the tractor. During the heavy rains last summer a cloudburst occurred at Canada Junction, which washed away a considerable portion of the trial track, leaving holes over a foot deep, and in other places piling gravel and earth on the track to a depth of several inches. Except for having to reduce speed very considerably, the tractor successfully passed over these obstructions, which had not been removed.

The trial at Canada Junction sufficiently demonstrated that the principle is entirely practicable; indeed, the small tractor available did much better in every respect than was expected.

Consolidated M. & S. Co., of Canada

The annual report of the Consolidated Mining and Smelting Co., of Canada, for the year ended Sept. 30, 1918, indicates that the fiscal year began under unfavorable conditions. The cost of producing zinc was still very high, and the Imperial Munitions Board had canceled its lead contracts. The costs of producing and smelting Rossland ore were steadily increasing, and the margin of profit had disappeared, and the coke supply was very uncertain, both as to quantity and price. All materials were almost prohibitive in cost.

Labor was extremely restless, owing to the ever-increasing cost of necessaries and to the continued agitation of a number of men with strong I. W. W. tendencies, who endeavored to promote sabotage, misunderstanding, and discontent. Every means possible was adopted to avoid a breach with the men, but, finally, demands were made in such a manner and in such direct repudiation of a definite agreement recently negotiated, that they could not be conceded. The men walked out on Nov. 15, 1917. The staff closed down the plant, unloaded the incoming freight, shipped out the metals on hand and kept the plant in repair. After six weeks' cessation from work, the views of the majority of the men (who never really favored the strike) prevailed, and the men returned to work under the terms of the agreement.

The year's operations were expensive, owing to intermittent operation, shortage of tonnage caused by the reduced purchasing power of gold, making mining operations impossible, and heavy overhead expenditure. The work was conducted with a view to holding the loss down as low as possible. The metallurgical results showed improved gold recoveries.

Operations at the lead-smelting plant continued to be unprofitable during the first part of the year. This was owing mainly to the fact that the metal recoveries were not as high as the quantities paid for. The metal losses were smaller than they had been for many years, but the prices paid for the metal lost were extremely high. In former years, each unit of lead lost cost the company from 40 to 50c., whereas in 1917-1918 the same amount of metal cost as much as $2.20.

In the latter part of the year much improvement was made in extracting the lead from the smoke. The percentage of extraction has already shown a substantial increase, although the installation to take full advantage of the recent discoveries is not yet completed. For many years the rates charged for smelting customs lead ores were too low to cover the metallurgical losses and operating expenses. On Feb. 1, 1918, these rates were advanced to cover expenses and insure a small profit.

Both of the lead and copper refineries worked on small tonnages most of the year, and they were handicapped on that account. The lead refinery showed a reduction in costs, especially in the latter months of the year, and proved that for small tonnage plants the Betts process can compare favorably with the Parkes process. The acquisition of a fluorspar mine will insure a further reduction in cost, the fluorspar needed having formerly been purchased in the East.

In the copper refinery the costs have been about as low as could be expected, with the exception of the melting and casting of refined copper. The great variety of shapes required by munitions orders for the small tonnage handled, and the difficulty in securing competent labor to do this work, made it advisable to have the copper cast in transit at Great Falls, Mont. In the meantime the melting plant is being enlarged and equipped to handle commercial orders.

The sulphuric and hydrofluosilicic acid plants were successfully operated throughout the year. Several improvements were made in the hydrofluosilicic acid plant, and there is now no difficulty in making sufficient acid to operate the entire plant.

Many important changes have been made in the zinc plant and concentrator. At the beginning of the year and prior to that date the cost of producing zinc was so high that it would have been impossible to keep the plant running when zinc dropped to its normal price. The plant was thoroughly reorganized, and large reductions were made in costs. Large-scale experimental work proved that further improvements could be made, more particularly in concentration. These are now being installed in the plant, and, when completed, will reduce the cost of producing zinc much further, and will also enable the lead and silver of the Sullivan ore to be reclaimed. The whole process has been worked out and designed for the complex ores of the Sullivan mine. It is possible, though, that other ores may be treated in the same way, but sufficient work has not yet been done to indicate which ores may and which may not be so treated. The year's developments and improvements have demonstrated that at last the problem of handling the complex Sullivan zinc ore has been solved.

With a plant operating on from 1000 to 2000 tons of this ore per day there should be no trouble in producing zinc and lead at a profit on any market that has existed in recent years, provided that the cost of labor and supplies falls with the price of these metals. This successful solution of the problem makes available many millions of tons of mixed ore in the Sullivan mine which formerly could not be considered commercial ore, although high in metal content.

Although all the present plant will be used, substantial expenditures on capital account must be made for the necessary extensions to treat the large tonnage mentioned; besides, it will take a considerable time to do this work.

The research department, which has become an important part of the organization, worked on the concentration of the ores in Consolidated and other mines; the metallurgical smoke problem; the manufacture of different chemicals from byproducts, and the solution of the various difficulties in the company's different processes. Some headway has also been made on the concentration of the low sulphide ores from Rossland. These results are especially encouraging, as the portion of the Rossland ores most amenable to concentration is that which is the most difficult and expensive to smelt. Great strides have also been made in reducing the costs and increasing the efficiency in the mines, though the full force of these will not be felt till working conditions become normal again.

In concluding the statement from which the foregoing abstract is taken, S. G. Blaylock, the assistant general manager, calls attention to the whole-hearted loyalty and energy of the staff who have been working out the various problems, and mentions W. M. Archibald, manager of mines, and his efficient staff; T. W. Bingay, controller; James Buchanan, smeltery superintendent; B. A. Stimmel, assistant manager of the zinc plant; J. K. Batchelder, superintendent of refineries; R. W. Diamond, superintendent of concentration and testing; G. F. Chapman, construction engineer; W. E. Jones, mechanical engineer; G. E. Murray, assistant superintendent of smeltery; A. L. MacCallum, superintendent of acid plants; F. E. Lee, W. H. Hannay, and R. K. Blois, research engineers; R. Vaughan, F. S. Willis, H. Woodburn, and R. G. S. Anthony, department superintend-

ents in the zinc plant; R. H. Hatchett, chief chemist; and F. E. Beasley, assistant superintendent of refineries. E. H. Hamilton resigned from the staff early in the year, and F. N. Flynn resigned on Aug. 31.

Additional statements are appended signed by James J. Warren, managing director; W. M. Archibald, manager of mines; T. W. Bingay, controller; and L. A. Campbell, vice-president and general manager of the West Kootenay Power and Light Co., Limited.

Portland Cement in 1918

Estimated shipments of portland cement in 1918 amounted to 71,645,000 bbl., valued at $113,910,000 compared with 90,703,474 bbl., valued at $122,775,088, in 1917, according to the U. S. Geological Survey. The figures show a decrease in quantity of 21% and in value of 7.2%, and, in fact, the cutput was the lowest recorded since 1909.

Exports of hydraulic cement from the United States for the first 11 months of 1918 amounted to 2,025,178 bbl., valued at $5,257,285, or $2.59 per bbl. The exports for all of 1917 were 2,586,215 bbl., valued at $5,328,536, or $2.06 per bbl. The decrease in output was the effect of the war restrictions imposed by the Government upon fuel supplies, transportation facilities, labor, and private construction work in general.

Two new plants produced portland cement in 1918—the Old Mission, at San Juan de Bautista, Calif., and the Three Forks, at Hanover, Mont.; and six plants were idle during the year, one each in California, Kansas, Michigan, Nebraska, New Jersey, and New York. The total number of producing plants in 1918 was 114, and the total number of plants that shipped cement was 115. The average factory price per bbl. for portland cement in bulk in 1918 ranged from $1.34 in the Tennessee-Alabama-Georgia district to $1.91 in California. The average price for the whole country was $1.59 per bbl. in 1918, compared with $1.354 in 1917. The wholesale market price of portland cement per bbl. at New York during 1918 ranged from $2.14 in January to $2.90 in September, compared with a range of from $1.92 to $2.12 per barrel in 1917.

Mine Motor Starters

Because of the injurious effects of moisture in mines, and the consequent severe operating conditions, special care must be exercised in the selection of motor starters and controllers, particularly those used for the ventilating fan and pump motors, as in most mines these two pieces of apparatus must be kept in continuous operation. Another condition which affects the operation of motor starters is the wide fluctuation in generator or line voltage caused by mine hoists and locomotives. For these reasons the standard design of hand or automatic starter will not operate satisfactorily, and one should be selected which is especially adapted for the conditions to be met.

A mine motor self-starter manufactured by the Cutler-Hammer Manufacturing Co., of Milwaukee, has recently been redesigned and now embodies several operating and protective features essential to the continuous operation of a ventilating fan or pump motor. Plain hand starters and starters without self-resetting features will drop to the "off" position every time a large decrease in voltage occurs. This, of course, stops the motors controlled by them, and serious results may follow. When a motor receives current at a voltage considerably lower than its rated potential, it will slow down; and it will stop when this voltage drops to a certain point or when the current is off. Control apparatus is required that will automatically insure the continuous running of the pumps and fans, even if at reduced speed, and that will also restart them.

To meet these conditions the starter mentioned, which is of the pilot-switch accelerator type and adapted for motors up to 100 hp., is equipped with a rugged relay which is sensitive and positive in its action. This relay guards against injury to the motor, and it causes all of the armature resistance to be inserted in case of a considerable drop in voltage, thus checking the heavy current resulting from the decreasing counter electromotive force. If the line pressure falls to about 80% of normal, the relay drops out, opening the control circuits to the accelerating switches, which drop, in turn, and cut into circuit the heavy-duty starting resistance, which has capacity for continuous service at low voltage. The motor then runs at slow speed until the voltage increases. At about 90% of normal, the relay pulls in again, cutting out the resistance and permitting the motor to accelerate to normal full speed.

A single coil overload, where shunt-wound motors are used, can be added to insert the armature resistance, in case of an overload, and thus keep the fan or pump going at a reduced speed. This single-coil overload and the voltage relay prevent the shunt motor from "flashing over" under severe voltage fluctuations. When the voltage drops to a low amount, the motor tends to run as a generator and is likely to "flash over" across the brushes, thus injuring the motor and commutator. With a compound motor the overload is not so necessary, because, when the motor tends to run as a generator, the compound winding opposes the shunt winding, neutralizing the field and preventing those conditions which result in "flashing over."

French Iron Mines and Steel Works in the invaded regions are to be reconstructed and reorganized by the "Société Corporative des Mines de fer et de la Sidérurgie des régions sinistres" which has recently been formed for the purpose of conducting commercial or industrial operations in this connection, according to the *Ironmonger*. The company is affiliated with the "Comptoir Central d'achats industriels pour les régions envahies," and has its offices with that organization at 40 Rue du Colisée, Paris. The new company is practically a technical commission of the Comptoir Central. For convenience, however, a separate share company has been organized. Its capital stock of 1,000,000 fr., divided into 2000 shares of 500 fr. each, is held by iron-mining and steel companies owning properties in the invaded regions of France. The society is administered by a "Conseil d'administration" (corresponding to a board of directors), composed of not fewer than 10 and not more than 25 members, elected by the shareholders. The new company is making estimates of the raw material and equipment that will be needed to restore the damaged iron mines and steel works in the northern and eastern part of France. Its method is to gather the best information available regarding the extent to which iron mines, blast furnaces, and steel works have been destroyed, and on the basis of these data prepare purchase programs covering the materials needed for replacement.

Defining "Tailings" and "Residues"*

BY A. W. ALLEN

Precise interpretations of the word "tailing" elude search among the more important technical treatises—with one exception. A comparatively recent textbook on ore dressing states that it may be defined as "material containing a metallic content in insufficient amount to warrant the expense of further treatment." This interpretation seems to conflict with recognized opinion on the subject. If a tailing is valueless, then what word can be used to designate the third product from a concentrating table, that subsequently undergoes further reduction and additional treatment; or the material from an amalgamation plant, that still contains a considerable proportion of gold, recoverable by cyanide; or the dump of sand awaiting treatment?

Failing to discover any acceptable definition, I turned to the Standard Dictionary, to find the word "tailing" defined by the Funk & Wagnalls authorities as "those portions of washed ore that are regarded as too poor to be treated further; used especially of the débris from stamp mills and other ore-dressing machinery, as distinguishable from material that is to be smelted." An archaic conception, possibly of reasonable acceptance about the middle of the last century, but somewhat out of date at present. "The débris from stamp mills"! And this definition was revised many years after a new process had multiplied the world's output of gold by making the treatment of this "débris" practicable. For further enlightenment I then turned to Webster's New International Dictionary, to read: "The lighter or refuse ore accumulated at the lower end of the buddle or washing apparatus, or carried away by the water."

The extended usage of a word in a particular and generally accepted sense is sufficient justification for its continuance. In the present instance, however, it is obvious that new methods in metallurgical work have resulted in an altogether different conception of finality in treatment. What was too poor to mine 50 years ago would now appear a bonanza. The alteration in conditions and the startling results of intensive research have revolutionized methods of handling. The material may remain substantially the same; its appellation is unaltered; the dictionary definition alone demands modification, because progress was unforeseen when it was formulated and passed unnoticed when it was revised.

The alteration in the meaning of the word "tailing" has been almost imperceptible. For a considerable time it was used to designate a material too poor to treat any further. Then came new processes. Tailings were still tailings, but they were valuable. The last word had not been spoken; the air of finality in the definition indicated a mistaken and pessimistic outlook on progress. So the use of the word has been continued in English-speaking countries to refer, in the great majority of instances, to something that would or might repay additional attention, although one product, at least, had been removed. The secondary treatment of what was previously considered valueless developed the necessity for an additional designation for the waste material finally discharged from the plant. The word "residue" was adopted, and has been extensively used in this connection.

In these days of complication in metallurgical treatment, the use of apt terms to designate the various products is a help to the operator and a necessity to the author. In bygone times, in the atmosphere of which our modern dictionaries are prone to linger, when stamp mills produced amalgam and débris, and when the summit of concentration achievement was reached with the single buddle, the need of an extensive vocabulary was less in evidence. Today agreement is a help in the coödination of impressions and experiences; and this cannot be achieved when technicians disagree as to the precise meaning of the words they use.

In hydrometallurgical literature the gold metallurgist was perhaps the first to differentiate between "tailing" and "residue." This was due, probably, to the absolute necessity of distinguishing between the two products. The same development has occurred in concentration practice with reference to the re-treatment of material which was previously considered unprofitable; but concentration specialists are inclined to overwork the term "tailing," by making it refer to all material from which concentrate has been removed, whether in the preliminary, intermediate, or final stages of treatment; or to go to the other extreme and consider it only as a waste and valueless product. If there was any indication of agreement, it would be another matter, and custom could be pleaded as a sound reason for the continued use of a term in the sense of an accepted interpretation. In the present instance there is no unanimity of authoritative opinion, although the need for harmony of expression, to facilitate reference and classification, is an obvious one.

In conclusion, the following definitions are submitted to summarize the points raised, and for the purpose, if possible, of opening a discussion on the subject:

Tailing.—The material from which one or more concentrated or partly concentrated products have been removed, and which is available for further treatment.

Residue.—The waste or final product from a hydrometallurgical plant which, at the time of operation, is valueless as far as metal content is concerned.

*The third of a series of articles on the standardization of terms used in hydrometallurgical operations. The previous papers, "The Difference Between Extraction and Recovery," and "Leaching and Filtration Nomenclature" were published in the Oct. 26 and Nov. 7, 1918, issues, respectively.

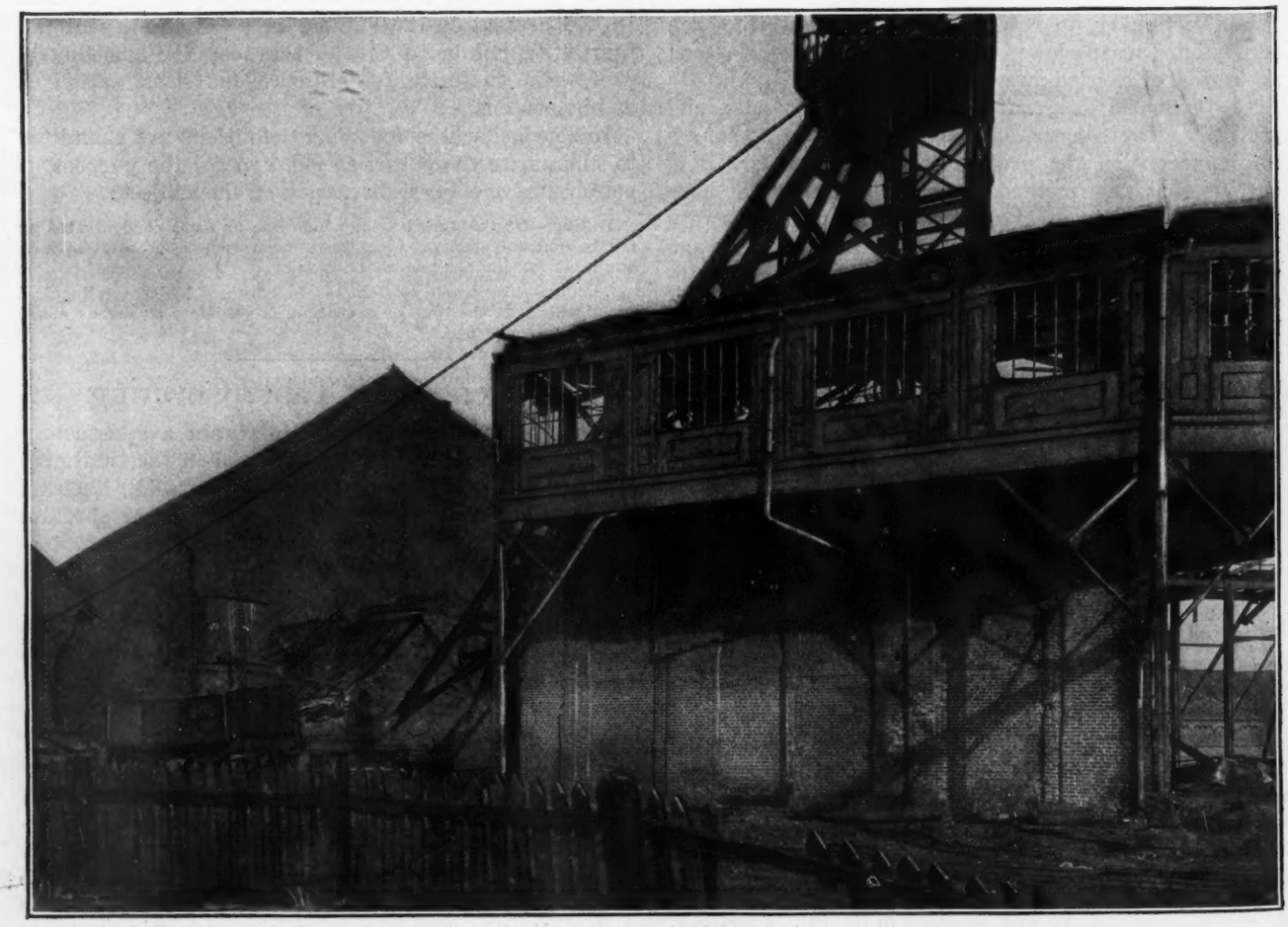
Concentration Table Covering

It has always been difficult to obtain a satisfactory covering for concentration tables used in the treatment of mineral ores. In lieu of a better material, linoleum has been largely used for the purpose, but the abrasive action of the ores, and, in the case of mine waters containing sulphuric acid, the corrosive action of the acid, soon destroys the linseed-oil content of linoleum.

Minefab is the name of a new material which has been specially developed to meet the requirements demanded, and a recent service-testing program, carried on simultaneously in a number of different mining districts, has proved its value. It is made with a heavy fabric base, coated on both sides with an extremely tough, flexible, protective film of pyroxylin, which ruggedly resists abrasion and is immune to sulphuric-acid corrosion. The coldest weather does not affect its flexibility, and it is absolutely waterproof. Being white in color, the contrast between it and the ore facilitates closer adjustment.

Havoc Wrought by Germans at French Mines

DESTRUCTION OF BLAST-FURNACE PLANT AT WINGHE, PAS DE CALAIS, FRANCE



HEADFRAME AT ONE OF THE ROEUF COAL PITS AT LOURCHES, FRANCE

HEADFRAME AT L'ECLAIREUR MINE, AT LOURCHES

HOISTING DRUM AT SCHNEIDER COAL MINES, LOURCHES, NORTHERN FRANCE

Mineral Production of British Columbia for 1918

THIS British Columbian official statement was prepared before the receipt of the official reports for the year 1918 of the gold commissioners and resident engineers of the province of British Columbia, and the customary returns of mineral production annually made by managers of mines and reduction works; consequently, it must necessarily be regarded as being a preliminary review of the progress of 1918, together with an estimate of the quantities and value of the several mineral products, which it is believed will prove to be approximately correct.

The accompanying table shows an estimated mineral production during 1918 of a total value of $41,083,093. It will be seen that the total value of the production of 1918, as estimated, is $4,072,701 greater than that of 1917, equivalent to an increase of about 11%. As compared with earlier years, the production of 1918 appears even more favorably, for it exceeds the next highest recorded production—$32,440,800, made in 1912—by $8,642,293, or about 26.6%. The value of the products of the metalliferous mines in 1918 was about equal to the preceding year, exceeding it by only about $3687. The great increase made is therefore almost entirely attributable to the products of the collieries, which show outputs, both of coal and coke, exceeding those of the preceding year, the increased output of coal being 142,093 tons, and that of coke 30,751 tons. In addition to this, the selling price of the coal was greatly raised by the exigencies of the war, and these two factors combined caused the value of the colliery products in 1918 to amount to about $12,794,932, an apparent increase over the preceding year of $4,310,589.

Mineral Production for 1917-18

The accompanying table shows the quantities and value of the several minerals produced in 1917, and the estimated production in 1918. It may here be explained that the prices used in calculating the estimated value for 1918 of silver, lead, copper, and zinc are the average prices for the year, as published in the *Engineering and Mining Journal*, less a deduction of 5% off silver, 10% off lead, and 15% off zinc.

Notes on Gold Production for the Year

Practically all the placer gold was obtained in the Cariboo and Cassiar districts, only about one-tenth of the total coming from the other regions.

During the last four years the production of placer gold in the province has steadily decreased. The chief reason is to be found in the economic conditions of high prices for labor and supplies, which made placer mining less profitable than in former years. Also, shortage of labor handicapped operations. So many men left for active service in the war that the number of individuals mining in a small way was materially less than in former years.

There are undoubtedly many deposits of gold-bearing gravels in the Atlin, Cariboo, and other districts, which, under normal conditions, will yet be worked either by hydraulicking or dredging. The increased demand for gold and probable lowering of costs now that the war is over should cause renewed interest in placer mining.

With regard to the increased production in lode gold, it must be considered that the 1917 gold production was abnormally low, the output for the years preceding the war varying from $4,000,000 to $5,000,000. The increase in 1918 over the preceding year is due largely to the entry into the producers' list of a new mine—the Surf Inlet property of the Canadian Belmont Mines—which made an output of about 43,000 oz. But for this added production, the gold output for 1918 would have been practically the same as in 1917.

The following table shows the estimated production of lode gold in British Columbia for 1918.

ESTIMATED BRITISH COLUMBIAN LODE-GOLD PRODUCTION, 1918, BY DISTRICTS

	Ounces
Boundary-Yale	56,734
Rossland	38,096
Skeena	48,621
Coast (Southern)	5,800
Lillooet	2,140
Nelson	4,300
All others	1,585
Total	157,276

The approximate silver production of the various districts for the year is estimated to have been as follows:

ESTIMATED SILVER PRODUCTION IN BRITISH COLUMBIA IN 1918 BY DISTRICTS

	Ounces
Slocan and Slocan City	1,353,265
Skeena	306,422
Fort Steele	288,540
Boundary-Yale	248,085
Ainsworth	225,020
Windermere-Golden	139,250
Coast	115,120
Omineca	96,758
Trail Creek	58,484
All others	55,917
Total	2,886,861

About 75% of the total output of silver comes from the treatment of silver-lead-zinc ores, and the remainder mainly from the smelting of gold-copper ores carrying silver.

Lead Shows Increase in Quantity and Decrease in Value

The total amount of lead produced in 1918 as compared with the previous year shows an increase in quantity of 6,642,196 lb., but, owing to the lower market price of lead, a decrease in value of $6393.

ESTIMATED PRODUCTION OF LEAD IN BRITISH COLUMBIA, IN 1918, BY DISTRICTS

	Pounds
Fort Steele	19,340,800
Slocan	11,665,700
Ainsworth	7,157,400
Windermere-Golden	3,031,000
Nelson	2,146,581
All others	608,180
Total	43,949,661

The above figures show, as compared with the previous year, that the lead production in 1918 was increased in Fort Steele, Ainsworth, and Windermere-Golden districts and that there was a slight decrease in the Slocan and Nelson outputs.

Copper Production Increased

The amount of copper estimated to have been produced in 1918 shows, as compared with the previous year, an increase in quantity, but, owing to the lower market selling price, a decrease in value.

The Hidden Creek mines and the smeltery at Anyox of the Granby Consolidated Mining and Smelting Co. were operated practically continuously throughout 1918, although closed for a short time by a strike, which was soon settled.

ESTIMATED PRODUCTION OF COPPER ACCORDING TO DISTRICTS IN BRITISH COLUMBIA, IN 1918

	Pounds
Skeene division	30,925,928
Southern Coast district	19,470,760
Boundary-Yale district	10,324,992
Trail Creek division	2,043,560
Omineca division	562,000
All others	59,770
Total	63,387,010

The Granby Co.'s mines at Phœnix were unable to supply the smeltery at Grand Forks with sufficient ore to run the smeltery at capacity. The ore reserves of these mines are approaching exhaustion, and the large-scale production of former years cannot be maintained. Also, the high operating costs during 1918 left little margin of profit in working the low-grade ores at Phœnix. To quote the Granby Co.'s annual report: "The old Phœnix mine has been run more from patriotism than hope of profits."

The Canada Copper Corporation, operating the Mother Lode mine and smeltery at Greenwood, treated a slightly smaller tonnage in 1918 than in 1917, from which approximately 2,200,000 lb. of copper was recovered, together with low gold and silver contents. Toward the end of 1918 the smeltery was closed, the ore reserves at the Mother Lode mine being exhausted.

Copper mining is now firmly established as the most important form of mining in the province, and from all indications it should maintain this place for years to come. In 1918 it formed 38% of the total value of the mineral production for the year.

Zinc Output Shows Decrease

The estimate of zinc output may be low, as it has been difficult to get information regarding shipments to the United States. The 1918 production is valued at $2,501,573, as compared with the 1917 value of $3,166,259, due to the decreased market price of the metal.

ESTIMATED PRODUCTION OF ZINC IN BRITISH COLUMBIA IN 1918, ACCORDING TO DISTRICTS

	Pounds
Fort Steele	22,000,000
Slocan	13,601,954
Omineca	327,940
Ainsworth	220,000
Total	36,149,894

The estimate for Ainsworth is only about one-quarter of last year's production, but final figures may increase the output for this division considerably.

Iron—The year 1918 produced a great demand for iron and steel on the Pacific Coast, the normal demand having been greatly increased by the need for steel in shipbuilding and munitions work, whereas the usual outside sources were monopolized by war needs in other parts of the world and the high freight rates made the lack of local production more pronounced. Consequently, it was suggested that the conditions are favorable for the establishment of an iron-smelting plant somewhere on the British Columbia coast. So far nothing definite has materialized, although there is apparently a prospect of such a plant being established. As is well known, there is on the coast an adequate supply of magnetite ore, sufficiently free from impurities to be within the "bessemer limit," to supply ore for such a plant.

During the summer months of 1918 the provincial government engaged Dr. Alfred Stansfield, of Montreal, to make a report on the commercial feasibility of smelting British Columbia magnetites in an electric furnace; the abnormal price of iron due to war conditions offering a possible field for that class of smelting. Dr. Stansfield's report will soon be made public.

MINERAL PRODUCTION FOR 1917–18

Material	Production, 1917 Quantity	Production, 1917 Value	Estimated Production, 1918 Quantity	Estimated Production, 1918 Value	Increase	Decrease
Gold, placer, oz.	24,800	$496,000	15,400	$308,000	.....	$188,000
Gold, lode, oz.	114,523	2,367,190	157,276	3,250,895	$883,705	.....
Total gold	.....	$2,863,190	.....	$3,558,895	695,705	.....
Silver, oz.	2,929,216	2,265,749	2,886,861	2,601,120	335,371	.....
Lead, lb.	37,307,465	2,951,020	43,949,661	2,944,627	.....	6,393
Copper, lb.	59,007,565	16,038,256	63,387,010	15,681,946	.....	356,310
Zinc, lb.	41,848,543	3,166,259	36,149,894	2,501,573	.....	664,686
Total metalliferous	.....	$27,284,474	.....	$27,288,161	3,687	.....
Coal, tons	2,149,975	$7,524,913	2,292,068	$11,460,340	$3,935,427	.....
Coke, tons	159,905	959,430	190,656	1,334,592	375,162	.....
Total collieries	.....	$8,484,343	.....	$12,794,932	$4,310,589	.....
Miscellaneous and building materials	.....	$1,241,575	.....	$1,000,000	.....	241,575
Total production	.....	$37,010,392	.....	$41,083,093	$4,072,701	.....

Platinum—The very insistent demand for platinum for war purposes caused a most exhaustive search to be made for it in commercial quantities by the Dominion government officials. A number of drill holes were sunk in the Similkameen district, the final results of which are not yet available. A small amount of crude platinum was saved as a byproduct from placer-gold workings, the exact quantities not being known.

Molybdenite—The urgent demand for molybdenite for war purposes continued throughout the first half of 1918, but gradually the market fell away. During the year a carload of molybdenite ore, carrying also gold, cobalt, and arsenic, was shipped from the Hazelton View mine, Hazelton, to the Mines Department at Ottawa for treatment. Returns on it have not been received. A small shipment of molybdenite was made from the Golconda claim, Osoyoos mining division. No other molybdenite shipments were reported.

Chromite—About 800 tons of chromite ore, carrying from 30 to 45% chromic oxide, was shipped from the Mastodon claim, Grand Forks division, in 1918, and a deposit on Scotty Creek, near Clinton, was opened up, but no shipments were made. With the end of the war the market for chromite temporarily collapsed, as large stocks are available, with no purchasers in sight.

Manganese—Fifteen carloads of ore, containing from 35 to 50% manganese, was shipped from the Curle Manganese group, near Kaslo. A large deposit of good-grade manganese was discovered during the summer of

1918 near Cowichian Lake. No shipments were made.

Non-Metallic Minerals—One hundred tons of fluorspar was shipped from the Rock Candy group, in the Grand Forks division. This property is owned by the Consolidated Mining and Smelting Co. and is being equipped to make steady shipments in the future. The mineral is shipped to the Trail smeltery and is used for making hydrofluoric acid, which is used in the lead refinery.

Shipments of magnesium sulphate (Epsom salt) were made from Spotted Lake, Osoyoos division; and 170 tons of magnesium sulphate was shipped from deposits near Clinton. Deposits of hydromagnesite in the Clinton division attracted considerable attention, but no shipments have been recorded.

A production of arsenic valued at $20,000 was made by the Nickel Plate mine in 1917, and although no figures have been received, a similar production is thought to have been made in 1918.

Zinc Used in Construction of New Jersey Zinc Co.'s New Building

A new building was recently completed for the exclusive use of the New Jersey Zinc Co. This concern, which has stood sponsor for many new uses of zinc in various forms, realized that for building purposes rolled zinc possessed many desirable features. Accordingly, plans were made, when the building was projected, to utilize sheet zinc in the structure and to use as much zinc in other ways as possible. This was at a time well in advance of the ruling of the War Industries Board which called upon manufacturers, as a patriotic duty, to substitute zinc for other metals in the non-ferrous field for a great variety of uses.

Flashings, gutters, and all other outside work upon the building are made of rolled zinc, this material having been substituted for copper, thereby effecting a material saving in cost. The substitution of zinc for copper offers a new field whereby building costs can be decreased, and the future should bring increased use of this metal for the foregoing purposes. Sheet zinc is easily worked and is non-corrosive, and its durability has been thoroughly demonstrated in Europe, where it has been employed for more than a century.

Over each door of the new building is carved a horse's head, the company trademark. The entrance and vestibule doors are constructed of sheet zinc rolled on wood. The knobs and locks are made of zinc plate, a detail that is embodied throughout. Zinc composition is the material used for the hinges. Side walls of the elevators immediately inside are of zinc construction. Likewise, the elevator doors and bell plates are zinc coated, giving a rich satin finish. All of the window hardware is manufactured from zinc plate. This includes sash, locks, and handles. A complete ventilating system is installed throughout the building. The grilles for the registers were first stamped and then zinc plated.

In the interior fixtures, zinc materials are consistently employed. This metal is used in the hardware, including trimmings and fittings, of the mail chute. Some of the panel doors inclosing cutout boxes, enunciator boxes and all low-tension work in the electrical equipment are made of zinc plate. The lighting fixtures are also zinc plate, and frames for the illuminating lamps are spun from rolled zinc sheets. Ornaments that are to be found throughout the building have been cast from zinc.

Paint, enamels and tints that compose the interior decorations include zinc oxide and "Lithopone" (zinc sulphide-barium sulphate) as ingredients. These are ordinarily used by paint manufacturers in the higher-grade paints and enamels, however, and their use is, therefore, not considered unusual in this structure. Many of the furnishings to be used are designed to be

NEW JERSEY ZINC CO. BUILDING, NO. 160 FRONT ST., NEW YORK

in keeping with the structural features of the edifice. These include desk fittings and office supplies, all of the materials for which are products of the company. This applies even to the window shades, which contain "Lithopone."

The amount of zinc used in the construction of the building is shown in the following items: The front doors contain 150 lb.; roofs and gutters, 700 lb.; lighting fixtures and equipment, 350 lb.; electric switch plates, 175 lb.; outlets, 45 lb.; hardware, 700 lb., and sherardizing consumed 100 pounds.

The utilization of zinc in buildings as described in this instance is an economic feature which is believed to be susceptible of greater development, especially for household purposes.

Deep Mining on the Rand

The lowest workings on the main incline from the Turf Mines shaft of the Village Deep have now reached sea level, i.e. 5,633.69 ft. vertical, which is the greatest depth at which mining is now done on the Rand, states the *South African Mining Journal.* All the natural obstacles to working at this depth have been successfully overcome. The rock pressure has proved the chief obstacle, but this has been countered by the special methods of support adopted. The increased heat nas likewise been offset by adequate ventilation.

Melting Silver, Nickel, and Bronze Alloys By Electricity

THE operation at the Philadelphia mint of a 1000-lb. Rennerfelt electric melting furnace throughout 1918 demonstrated the fact that melting silver, nickel, and bronze alloys by electricity is economical and saves both time and labor. Tests have been thoroughly satisfactory, and have indicated savings of approximately 40% in costs of melting. It is purposed to install similar furnaces at both the San Francisco and Denver mints. For the Philadelphia mint two additional furnaces of the same type have been ordered, one of 1000-lb. and the other of 1-ton capacity. The new furnaces will be equipped with improved power-tilting and power-pouring devices, by which each furnace will rotate about the pouring lip as a fulcrum. This will permit of molten metal being poured directly into molds mounted on trucks running on a track that will pass under the pouring lip, the trucks being propelled by electric motors with automatic stop. Direct pouring of molten metal will obviate the necessity of pouring into ladles and then into molds. The new furnaces will also be equipped with automatically controlled electrode feeds, by which the temperature will be regulated.

The electric current was first turned on in the operation of the 1000-lb. Rennerfelt furnace, on July 9, 1917, being supplied from an outside source. It is of 3-phase, 60-cycle, and 2200 volts, transformed at the furnace to 110 volts. The total weight of the complete furnace ready for current is 12 tons.

It was several weeks, however, before conclusive evidence from numerous tests indicated that the furnace fully met requirements. There seems to be no absorption by the nickel of the carbon in the incandescent electrodes, which would result in inferior metal. It has been stated that the atmosphere in the furnace under heat is non-oxidizing. Results, however, have shown that every precaution must be taken to keep the surface of the molten metal covered if good non-oxidized ingots are to result. Should the furnace attendant neglect to keep the door closed and the metal covered, oxygen from the outside air will, of course, cause trouble. In any open furnace where the crucible is dispensed with, there will always be more or less trouble attributable to refractories fusing and being carried into the ladle or mold. It has been found, however, that practically all this difficulty is obviated if a spout is built upon the ladle, so as to secure the good results of a bottom pourer. The question of loss of heat between the furnace and the molds is a point worth consideration, and although a bull ladle is now being used at the Philadelphia mint, on account of the present furnace not fulcruming at the spout, it is hoped, as before stated, ultimately to pour directly from the furnace into molds. The chilling effect of a thin stream across 18 in. or more of spout results in the molten metal taking a sinuous course, which is indeed not only difficult to direct properly, but, by reason of its small cross-section, is soon too cool to make good bars. At the Philadelphia mint it is the practice to hang a 200-lb. ladle in the shank on the bearings attached to the front of the furnace. This ladle can be rapidly filled without spilling the metal, and the melters are relieved of the weight during the pouring period. As the turntables carrying the molds are within 10 ft. of the furnace mouth, the operation of taking off a heat with two ladles, pouring simultaneously into two sets of vertical molds, consumes 15 min. and is done with no confusion. The mint operatives prefer the shank with one swivel end. The weight of the ladle, shank, and metal is about 200 lb. This weight is borne by the two men only a fraction of a minute, after which the shank is placed on a bail on the chain hoist in position for pouring. As the ladle is emptied, the man on the swivel end of the shank operates the chain to maintain a proper pouring distance between the lip of the ladle and the mouth of the mold.

To avoid oxidation during the period of filling and emptying the ladle, as the pouring from the furnace starts, some granulated pine charcoal is immediately placed on top of the molten metal in the ladle. Owing to the provision of a specially constructed skimming spout, the charcoal is held back, the surface remains well covered, and only clear metal free from carbon flows into the molds. Though ordinarily no metal shows the results of oxidization within the furnace itself, this is possible, particularly on scrap metal, where chips presenting a comparatively large surface are used, and the necessary precautions not exercised. Where the melts consist mostly of bar metal, operatives are seldom annoyed by this bugaboo, which is so well known by all melters of non-ferrous alloys.

This electric furnace is rated at 125 kw. and 750 lb. of metal. It has been found, however, that 1000 lb. per charge is correct, and the men endeavor each time to hold the heat at that weight. This provides for 33 bars before shearing, which will measure 24 in. in length, 4½ in. wide, and 1 in. thick. The furnace is never allowed to cool off entirely, except when repairs may be necessary. After a run of 8 to 12 hours, if a shut-down period follows, coke or lump charcoal is thrown in the hot furnace, and added from time to time until the current is again thrown on. There is no difficulty incident to stirring the metal in this furnace, and analyses on cupro-nickel and bronze alloys show a good mixture. The cupro-nickel melts are not stirred, the temperature at pouring being sufficiently high to bring about a thorough mixing. The volatilization loss in the furnace would seem to be somewhat higher on zinc in the bronze alloy than in crucible furnaces, the assayer reporting losses averaging about one-half to three-fourths of 1%. Figures, however, on this volatilization loss are not yet conclusive.

The furnace has proved its worth on cupro-nickel, bronze, and on silver-coin melting. In the latter case samples taken from top and bottom of a 1000-lb. melt showed homogeneity. In an alloyed melt, and when reducing fineness from 902 to 900 with the comparatively

*Abstracted from the 1918 report of the Director of the Mint, Treasury Department, Document No. 2822, p. 11.

small amount of copper required, assay returns were most encouraging, and there is a good prospect of being able to use the furnace for silver-ingot making. The first roof on the furnace lasted for 799 heats, and the cylinder was not renewed until 1277 heats had been made, the heats being of cupro-nickel and bronze, the former predominating. In the second run the roof lasted over 1000 heats. The table following shows quantity and variety of metals melted in the electric melting furnace during the fiscal year, and the current consumption per ton of metal melted, and time per 1000-lb. melt:

Variety of Metal	Gross Ounces Melted	Time to Melt 1,000 Lb. in Min., Preheated Furnace	Kilowatt-Hour Consumption per Net Ton, Average
Cupro-nickel	15,980,341.80	100	500
Bronze	11,988,277.23	70	300
Silver	10,031,101.00	60	198
Tin	57,147.00	10	46

The cost to melt the most refractory alloy handled at the mint—cupro-nickel—in the electric furnace is $9.45 per net ton, which is less, by 50%, than the amount incurred when gas and crucible melting is practiced.

The Aftermath in Paris and London

By Mark R. Lamb

France has begun to beat her arms into plows and other useful things. Shell steel is being diverted to other uses. A few score of German field guns are grouped around the Arc de Triomphe, and may stay there, but the exhibition shows how quickly such instruments become worthless except as scrap steel. They are rusty, parts are gone, and there is an impulse to call the oxy-acetylene man to cut them up for the electric or openhearth furnace. An interesting (and perfectly safe) stunt is to stand behind the guns and peep out through the bullet holes in the steel shields, trying to imagine how it would be to see and hear how such holes are made. An insignificant, unpretentious ruling was made today by the postoffice. Hereafter mail to and from Luxemburg will be paid on the same basis as the other parts of France and her colonies. I wonder if Mr. Wilson saw that?

Register with the police on arrival in England, as you are advised. It is better than to forget. Then get your meat tickets; otherwise you will live on fish and fowl. Curious that there is no shortage of bread in England, and no shortage of meat in France.

Do not come to Europe expecting to buy as cheaply as before the war. It will be a long time before clothes will be reasonable in price. Sugar is not served. You are permitted to import 1 lb. of sugar in your baggage, but more than that will be confiscated. One gentle lady was terribly mortified to see her trunk leaking a trail of sugar, but the inspector (who says the law is foolish) failed to see the leakage. To those of us in the States, who at great personal sacrifice (?) limited ourselves to 3 lb. of sugar monthly, it is a joke to see the entire British nation gravely carrying its sugar ration in its pocket. At breakfast, out comes a paper bag, a soap box or a jewel casket, and its owner carefully selects a suitable lump for the tea and another (to be ground under heel) for the porridge. The ceremony of wrapping this in a paper napkin and grinding on the floor is alone worth the trip to see.

Your most fashionable friend on Piccadilly invites you to tea. The house is gorgeously decorated and furnished with rare things. The owner is wealthy, and his wife a dream of fashion, but—you sit closely around a fireplace. Snow fell last night in London. Yet you look at the fireplace twice to discover the fire. I think the coal allowance is 200 lb. annually for all purposes of the household. The master says: "We realize now that we have not studied heating as you Americans have. We sleep cold, eat cold, bathe cold, and in general live cold."

About the time tea is served the mistress touches the bell, and to the maid languidly says: "Maria, the bones." Maria dutifully goes for the bones—for the soup! The bones are carefully suspended over the fireplace in this magnificent drawing-room, simply for lack of coals in the kitchen. They simmer along, most of the odor coming into the room with the coal smoke, which the wintry wind outside puffs down the chimney. Your insatiable curiosity persuades you to accept the invitation to stay to informal dinner. As the time approaches, the excitement becomes intense. With much trouble the maids and men succeed in scorching the fish and drying out the chops. (You have not yet obtained your meat tickets, so the chops are few.) How you long to show them how cooking on an open fire is done in the mountains!

In all seriousness and perfect gravity, and with no excuses, the dinner is prepared and eaten. And to think that all England is living like that! England with coal for all the world and miners to mine it! Patience! They will soon be back from France. It shows, at least, what Englishmen will stand for in a good cause, and what we in America would have come to, except for the English fleet, and France, and Belgium, and poor little Serbia, and Italy, and those who helped in Russia, and, last but not least, Germany's bad management.

Bring all your money. It is easier than cabling for it. And don't bring travelers' cheques. Everyone except the issuing company itself discounts them heavily. These are a few prices: One little sour orange, 10c.; one little sour apple, 15c.; one nice big apple, $1.20; one large *luscious* pear, 7fr., i.e., $1.40. These are honest-to-goodness prices. Grapes (hothouse variety) are as large (nearly) as golf balls and cost 2c. each. Yes, each—not per pound. A lunch of fish, meat, and potatoes, without wine, $2.

So in considering your branch office, figure expenses multiplied by three as compared with New York. I am not sure your office will pay, but some offices will, and I hope mine is among the number. If expenses are high, prices of American goods are also high. The demand is good. Stores are crowded. Wages are high. Those who have escaped the war must go on living, and they now know better how to live.

The autos are all gone. The wrecks that now infest the streets are of the vintage of 1913, and they look it. They are, many of them, returned from the front line. And how the city needs paint and varnish and is crying for it! Never mind choosing a representative who knows French. Everyone here, even the policeman, has a few words of English. Choose him for his ability to see where your products are needed.

Typewriters are sold at double the American prices. Sixty per cent. of the shoes used in England are made

in America and are now double in price. I had planned to take home a nice, heavy English overcoat at a reasonable price, so came over with an old one. It was a mistake. Of course I bought one, because it is necessary to have one on, at least during dinner (it makes me sneeze to think of it); but I'm stung. The wool that once was in English coats has gone to supply blankets for English and American soldiers; so this is not a complaint.

London and Paris are both dark, and it is dangerous for an unsophisticated American to be alone on the streets at night. The Seine is over the walls, and this means that the coal barges cannot navigate. We are cold, but will be colder. The coal is of poor quality, anyway. Many slack heaps in Pennsylvania are coarser than the best grades delivered here. From this it will be seen why any kind of briquet is acceptable. It is a fact that large rectangular briquets are still made. They are stacked carefully each time they are moved. Then when used they must be broken by hand. The small oval briquet is in evidence, and when properly made is in great demand.

The heat is turned on in the hotel morning and evening for an hour, but now that the Peace Conference is on, we keep warm (with rage) wondering if the Germans are to be paid their war expenses. In Paris the men are happy enough, but one sees too many sad-eyed women in mourning. Who will pay *them?*

Yesterday the *Excelsior* published a map of Paris showing the location of every bomb dropped by the Germans—a total of 270, causing 266 deaths and 603 wounded. Today the map is of the shells from the long-range gun—182 shells, with 256 killed and 620 wounded. Will the Kaiser be content when he reads the list and sees the map?

After seeing just one battlefield and devastated city, I am ready to accept a position as Peace Commissioner; and I defy any Frenchman to ask for conditions against Germany that I would not grant.

It seems good to hear American autos and flivvers hooting about the city. There are plenty of American soldiers and officers here, but the first impression is that there are far more Y's and K's than regulars. Perhaps they still have their uses. It is to be hoped that those many shiploads of food for France and England will be sent promptly. It is badly needed, and, besides, if it does not arrive promptly, it will do me no good.

Mount Lyell Mining and Railway Co.

The reports and statements of accounts of the Mount Lyell Mining and Railway Co., Ltd., at Mount Lyell, Tasmania, for the year ended Sept. 30, 1918, show that a profit of £455,898 18s. 7d. was made. After deducting £18,022 13s. 4d. for prospecting and development, £50,397 for depreciation of mine and other plant, £64,403 6s. 4d. for taxes, and £60,000 for appropriation for new plant expenditures during the present year, the net profit from all sources amounted to £247,288 10s. 6d., as compared with £268,611 4s. 4d. for the year ending Sept. 30, 1917.

The total quantity of ore mined was 264,542 tons; and 240,947 tons of mixed material—ore and concentrate—was smelted. The blister copper produced amounted to 5773 tons. The flotation plant treated 29,703 tons of ore, averaging 2.95% copper, and the extractions for the year were 88.06% of the copper, 74.25% of the silver, and 68.24% of the gold.

The new converter plant was put in operation early in August, and is working satisfactorily. The recovery of sulphur from the pyrite is under consideration. Coal-dust firing was applied to a rotary distillation furnace, but the locally obtained refractory materials proved unsatisfactory. Tests are being made with gas-fired furnaces.

The ore reserves show a small increase. The estimates as of Sept. 30, 1918, are: Mount Lyell mine (including South Lyell mine), 2,028,747 tons, containing 0.49% copper, 1.48 oz. silver, and 0.04 oz. gold per ton; North Mount Lyell mine, 1,036,300 tons, containing 6.0% copper, 1.33 oz. silver, and 0.005 oz. gold per ton.

Tomboy Company to Adopt Flotation

The Tomboy Gold Mines Co. has decided to erect a plant for the treatment of its ores by the oil flotation process, and has advised D. A. Herron, the general manager, immediately to place the orders for the material required.

This matter had been under consideration for a considerable period. It was referred to in the annual reports for 1917 and 1918, and by the chairman in his speech at the last general meeting. At that time definite action had to be delayed owing to the war, but now Mr. Herron is confident that, if he can place the orders at once, he will be able to get delivery of the material required in good time to enable the plant to be erected this summer.

The directors have been guided in this matter by a joint report of the general manager and R. M. Raymond (who is acting as the company's consulting engineer during Maj. P. L. Foster's absence on military duty), in which they strongly recommend the adoption of the oil process, and say that "it can conservatively be counted upon to effect a betterment of at least $1 per ton on the present grade of ore." The directors have had the further advantage of personal conferences with Major Foster in London, and he emphatically recommends the adoption of the process and the immediate erection of the plant.

The estimated cost of the plant is $150,000, to be met out of earnings; and on the basis of present output the additional profit derived from its installation should be $12,500 per month, sufficient in 12 months to reimburse the company for the expense that the improvement will entail.

A New Special Mine Pump, to be driven by helical gears instead of spur gears, is being built by the Midwest Engine Co., Indianapolis, Ind. The new pump will be of a duplex, double-acting, power-driven plunger type, unusually rugged in construction, and, because of its special and unique features, it is theoretically calculated to withstand the severe duty imposed by gritty and acid mine water. Experiments to overcome the rapid depreciation in pumps caused by mine conditions have been conducted by the Midwest company for some time, in order to develop a metal of such composition as will withstand deterioration due to acid water. A cast iron has been developed which shows a tensile strength as great as that of cast steel.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

Copper Conference Continues

Resolutions urging the enactment of legislation which will make possible the extension of long-term credits to foreign buyers of copper were adopted by the labor delegates from the Western copper-producing areas, who were in Washington during the week ended Feb. 8 conferring with the Secretary of Labor. John D. Ryan, the president of the Copper Export Association, was a party to the conference. He declared that the producers have no secrets which they care to withhold from their men with regard to the present situation. He gave to the conference all the information in his possession which has a bearing on the solution of the problem which confronts the industry. The labor delegates appointed a permanent joint conference committee, which is empowered to confer with their managers in an effort to establish a working agreement as to wages to cover the period of readjustment.

The resolutions which were adopted by the labor delegates are as follows:

Whereas, The copper industry is now confronted with the most critical situation in its history because of an enormous surplus of copper in stock for which there is no market at present; and

Whereas, The Department of Labor, realizing that existing conditions are causing a radical reduction in working forces by the various companies that entails hardship and dissatisfaction, has offered its services in trying to find a solution for the problems; and

Whereas, Mr. Eugene Meyer, Jr., chairman of the War Finance Fund, has assisted in many ways in helping to bring about a readjustment of conditions, and in persuading the various Government departments to hold the copper now owned by them instead of "dumping" it and causing a further demoralization of the market; and

Whereas, Mr. James Lord, president of the mining department of the American Federation of Labor, has worked tirelessly to help solve the many problems that confront us,

Be it resolved, That this conference of men from the mining industry from Arizona, Montana, and Utah express our appreciation to the Secretary of Labor, Mr. Wilson, and his associates in the Department of Labor for the valuable advice and coöperation they have given in this critical time;

Be it further resolved, That we extend to Mr. Eugene Meyer, Jr., and Mr. James Lord our sincere appreciation for their efforts in behalf of the men in the copper industry;

Be it further resolved, That we urge the officials of the Department of Labor to continue their efforts to bring about conferences with the employers, that all those interested may cooperate in preserving industrial peace and in solving the big problems of getting the industry on a peace basis.

Whereas, The copper industry in peace times has always depended upon export trade for over half its product, and

Whereas, We deem it to the best interest of labor and industry in this country to help to remedy this temporary breakdown of the machinery of international trade, and

Whereas, It appears upon reliable authority that foreign countries have great difficulty at the present time in financing purchases of the products of our country,

Be it resolved, That this meeting of representatives of the labor of the copper industry do urge and recommend that Congress pass such legislation authorizing Government aid as will furnish the necessary long-term credits to facilitate the resumption of our export trade in raw materials, agricultural products, and manufactured goods

The Senators and Representatives from Montana, Utah, and Arizona were visited by the labor delegates and urged to expedite the passage of a bill which would aid banks and trust companies in extending financial help to all purchasers of copper. The delegates will return to their districts to discuss the results of the conference with their fellow workmen, so as to prepare the way for a prompt readjustment of the wage scale.

The Department of Labor is represented throughout the conferences by Secretary Wilson, Felix Frankfurter, H. L. Kerwin, and Hywel Davies. Mr. Davies is Federal Labor Administrator for Arizona. Eugene Meyer, head of the War Finance Corporation, who was a party to the conferences, is expected to outline the steps necessary to secure the financial aid which will be required.

The comparison of wages paid on the war basis to copper miners, with what would have been paid on a peace basis, according to the sliding scale, which was discussed on page 286 of the *Journal* of Feb. 8, is made in the following table:

WAGES PAID COPPER MINERS ON WAR BASIS AND ON SLIDING SCALE

Comparisons	War Basis	Sliding Scale
26c. copper in Butte	$5.75	$5.00
20c. copper in Butte	5.00	4.50
18c. copper in Butte	4.75	4.25
26c. copper in Clifton	5.00	4.00
20c. copper in Clifton	4.25	3.25
18c. copper in Clifton	4.00	3.00
26c. copper in Globe, Miami and Jerome	5.90	5.15
20c. copper in Globe, Miami and Jerome	5.15	4.40
18c. copper in Globe, Miami and Jerome	4.90	4.15
26c. copper in Bisbee	6.05	5.30
20c. copper in Bisbee	5.25	4.50
18c. copper in Bisbee	5.00	4.25

Among the articles taking the new Shipping Board rate of $1 per 100 lb. from north Atlantic ports to England, Scotland, and Ireland are copper ingots, lead billets, mica, spelter, vanadium, zinc ashes, zinc dross, and zinc oxide. Ferrosilicon takes the rate of $1.50 per 100 lb.; pig iron, $20 a ton; and silver in bars, 1% ad valorem.

The potash bill, which was approved by the Secretary of the Interior and considered by the Senate Committee on Mines and Mining, has been altered and introduced by Senator Henderson. The bill has been restricted to domestic potash, and the time for licensing imports has been reduced from five to two years after the signing of the peace treaty.

The only exceptions to the order of the War Trade Board, dated Jan. 30, which permits the use of a general rather than an individual import license, are tin, tin ore, tin concentrates, metals containing more than 5% of tin, nitrates, spiegeleisen, ferromanganese, Naxos emery ore, Naxos emery, breadstuffs, feathers, furs, meat and meat products, peanuts, and rice.

After extended debate, the House of Representatives by a vote of 71 to 226 refused to instruct the conferees to accept the Henderson amendment providing relief for war-mineral producers, which became section 7 of the Dent bill for validating war contracts. This left the conferees free to insist on numerous changes in the section. The debate in the House showed that body to be about equally divided in regard to the matter of relief for the producers of war minerals.

Protecting American Rights in Mexico

Because of the conditions that have existed in Mexico during the last eight years, with such a disastrous effect upon the lives and property of foreigners in that country and upon the lives, property, and wellbeing of the Mexican people themselves, an organization, known as the National Association for the Protection of American Rights in Mexico, has been formed by a group comprising some of those who responded to Mexico's invitation to invest in enterprises in that republic, as well as others who are desirous of assisting in the protection of American rights and in the promotion of the welfare and peace of the common people of Mexico, who are among the principal sufferers from the chaotic conditions now prevailing.

It must be apparent that the effective, practical, and friendly recognition by the Mexican government of its obligation to protect American and other foreign rights will be followed by a rapid development of Mexico's resources, with increased revenue to the government, reëstablishment of its credit, employment for its people, and a supply of food products more than sufficient for the country's needs. But it is also clear that this development is largely dependent upon the continued help of American capital and enterprise, neither of which will be available for this purpose until the Mexican laws and officials recognize the rights of Americans and afford adequate protection to their lives and property.

The organizers of the association feel that gross injustices have been committed in Mexico to American citizens and to American property rights; that there has been a lack of accurate information concerning the actual conditions which have prevailed and a lack of coördinated effort to prevent their repetition; that there exists a vital necessity for the creation of a medium for the ascertainment of all of the facts bearing upon the Mexican situation, and through which an appeal may be made to public opinion and to the governments of Mexico and of the United States; and that it is only through concerted action, in which it is hoped all persons interested in Mexico may participate, that a condition of stability and responsibility in that country can be effected which will result in the full recognition and protection of American rights.

It seems clear that too much light cannot be thrown upon the facts regarding the Mexican situation, if intelligent and effective action on the part of the American people and representatives is to be secured. To that end the association will, among other things, collect all data regarding foreign industries and enterprises in Mexico, will keep in touch with all decrees, laws, regulations and other developments affecting American rights in Mexico, and will be prepared to furnish information in respect thereto to the Government of the United States and to the American public. It will also make a thorough study of the Mexican situation from historical, legal, and economic standpoints, and will request its members to keep it constantly informed as to such matters as will enable it to prepare a complete report on any violation of American rights in Mexico, upon the resultant paralysis of American enterprises, upon the effects of such acts upon the moral and economic life of the Mexican people, and upon such other matters as bear upon the relationship between this country and its citizens and the Mexican republic and its people.

The association will endeavor to keep itself constantly in touch with the Mexican government and with the government of the United States as to all matters affecting American rights and property, and will at all times be prepared to take and vigorously prosecute such legitimate steps as may be necessary for their protection.

It is the desire of the association not to embarrass the Government (which might have appeared to be the case had this organization been undertaken during the continuance of hostilities in Europe), and not to bring it into conflict with the Mexican government; its chief aim will be to work with both governments upon a friendly and helpful basis with reference to all the aforementioned matters.

If such a program can be carried out, the organization can, it is confidently believed, be of great service in assisting to remove causes of friction between the United States and the Republic of Mexico. The success will be largely dependent upon the extent and character of its membership, which should be nation-wide; and, in order that the largest possible number of members may be secured in the shortest possible time, it is urged that all those who are interested in the object and purposes of the association as above outlined immediately send their names and addresses, together with a statement of the particular nature of their connection with Mexico, to Frank J. Silsbee, Secretary, at the temporary office of the association, Room No. 2800, 120 Broadway, New York City. A blank application for membership in the association, together with such further information as may be desired, will be furnished upon request.

Association of the 27th Engineers

REPORT OF THE SECRETARY-TREASURER

Nov. 24, 1917, to Dec. 31, 1918.

Up to Jan. 1, 1919, this association had received subscriptions and funds from other sources as follows:

Subscriptions as reported in *Eng. and Min. Journ.*	$19,580.95
Additional receipts in 1918, but not reported to end of year	553.96
Interest on bank deposits	197.91
Exchange	.75
Annual dues	5.00
Total	$20,338.57
Uncollected	593.36
Receipts	$19,745.21

Its disbursements have been as follows:

Athletic goods	$2,054.68
Musical instruments and music	2,566.54
Cigarettes and tobacco (not including Christmas present)	2,165.97
Games	95.75
Typewriting machines	341.50
Miscellaneous (cash to company funds)	1,052.30
Wool (550 lb.), cloth, and knitting machines (2)	(a)1,224.39
Miscellaneous goods	13.65
Exchange and bank charges	14.29
Assistance to men and families	(b)133.65
Christmas present, 1918, sent through Lieut.-Col. O. B. Perry	2,500.00
Total	$12,162.72

(a) The actual amount paid for wool purchased was $1834.82, but part of it was sold, the proceeds of which amounted to $610.43, which has been deducted.

(b) $143.65 was disbursed, but $133.65 is entered, $10 having been returned.

The balance on hand Jan. 1, 1919, is $7582.49.

All expenses in administering the fund and the affairs

of the association generally were assumed by the *Engineering and Mining Journal.*

I understand that Colonel Perry has made some expenditures in behalf of the men in France, to be paid for out of the Comfort Fund, as to which I have not yet received detailed advices. Consequently, I am unable to include them in the account for 1918.

Following is a report on the activities of the Woman's Auxiliary of the American Institute of Mining Engineers on knitted goods, which supplements a previous report already published.

As has been previously reported, the Association of the 27th Engineers provided the Woman's Auxiliary of the American Institute of Mining Engineers with two knitting machines, a quantity of wool, and material for 72 wool-cloth sweaters. The members of the Auxiliary, their friends, and some others who were interested in the regiment, went to work enthusiastically, and up to the end of the year had turned in the following articles: 170 sweaters; 773 pairs of socks; 89 pairs of wristlets; 85 helmets; 3 mufflers.

Included in the above are some donations obtained by the association and the Woman's Auxiliary, the wool for which was not supplied by the association. Of the above goods, the following were shipped to the regiment, part to the First Battalion and part to the Second; 121 sweaters; 500 pairs of socks; 89 pairs of wristlets; 85 helmets; 3 mufflers.

A donation of 24 comfort kits was also received.

After the regiment had gone to France, it was impossible to make shipments, owing to Government regulations. The unshipped goods were held, hoping that some way might be found to get them to the regiment, but it appeared to be impossible, and, after the armistice was signed, having learned of a great need for knitted articles by the Navy League for distribution to soldiers and sailors, I took up with the League the matter of turning over our supply. They were grateful for our offer, and accepted the following goods, the understanding being that they would supply a similar number for the men of the 27th Engineers, should the need arise: 49 sweaters; 263 pairs of socks.

It is not expected that there will be need for the above, and I feel that all who had anything to do with the donation or making of the goods should be glad that they have been applied to fill a real need, although, of course, there is regret that they could not be sent to our own regiment.

When it was considered advisable to discontinue knitting, there was a rather large supply of wool on hand, which was offered to the Navy League, from which it was purchased, and they bought it back at the same price the association paid for it. The proceeds from the sale of this wool, and some small lots which were taken by individuals, amounted to $610.43.

The matter of wool and knitted goods has not yet been finally closed, owing to delayed returns. At the present time there are about 10 pairs of socks on hand to be disposed of, and there is also a supply of wool, probably not more than 30 pounds.

Thanks are due to Mrs. H. N. Spicer, who worked untiringly as chairman of the Emergency Committee of the Woman's Auxiliary; to Mr. A. L. Gresham, assistant to the secretary of the American Institute of Mining Engineers, who very kindly assisted with the distribution of the wool, receiving the goods, shipping, etc.; to the American Institute of Mining Engineers, which gave permission for the use of its rooms for the meetings, storing and handling of material; and to all others who generously coöperated in the work.

In making disbursements from the fund we did not have it in mind that the termination of the war was coming so soon as it did, and therefore a rather large balance of cash was left on hand. However, this will not be so large as it appears, for, as noted above, Colonel Perry, who has been taking good care of his men, has made expenditures for their comfort in France whereof details have not yet been reported, besides which Colonel Perry has generously dipped into his own purse. Anyhow, it is certain that all the money on hand, and more, too, will be needed in welcoming the men home and giving a helping hand to those who need it. Therefore the subscription list is not closed. From all that we hear, the care that the mining industry has given its men has contributed to producing a fine spirit among them and has done much to make the 27th Engineers one of the distinguished regiments of the service.

W. R. INGALLS,
Secretary-Treasurer.

Employment for Engineers

For the convenience of engineers returning from military service, a list of agencies is here given which may be helpful to those who are seeking employment:

Engineering Societies Employment Bureau: Walter V. Brown, secretary, 29 West 39th St., New York City.

Division of Engineering, United States Employment Service: A. H. Krom, director, 29 South La Salle St., Chicago, Ill.

Professional and Special Section, United States Employment Service: George W. Kirchwey, state director, 16 East 42d St., New York City.

Tongkah Harbour Tin Dredging Co.

MELBOURNE CORRESPONDENCE

The Tongkah Harbour Tin Dredging Co. is registered in Tasmania and operates in Siam. It has been one of the most successful Australian-owned tin companies in the East. The report for the year ended Sept. 30, 1918, shows increases in yardage handled and in returns of tin oxide as compared with the previous 12 months. The value, too, was 15.7d. per ton, as against 9.4d. in 1917. The general manager, Eliot T. Lewis, states in his report that the smallness of the increase is due to the fact that shortage of material prevented the carrying out of all but absolutely essential repairs. Data of operations are given in the following table:

STATISTICS OF OPERATION OF TONGKAH HARBOUR TIN DREDGING CO., IN 1917–1918

	1918	1917
Ground dredged, cu.yd.	3,383,250	3,682,550
Tin oxide produced, tons	1,314	1,188
Average yield per cu.yd.	0.870 lb.	0.723 lb.
Average value per cu.yd.	15.717 d.	9.439 d.
Value of tin output exclusive of royalty	£221,561	£144,845
Average price of tin ore concentrates	£168/12/5	£121/18/—
Average cost of production per cu.yd., exclusive of depreciation	5.021 d.	4.403 d.
Average surplus per cu.yd. available for profit and loss account	10.696 d.	5.036 d.
Actual net profit	£118,920	£67,923

The sum of £80,302 was brought into the accounts from the previous year. The profit on working account for the current term was £150,783, of which £118,920

remained as net profit after payment of all charges and royalties, and providing for dredging boat channel and depreciation of plant, stores, and spares. Of the resultant £199,222, four dividends (equaling in all 40%, or 8s. per share) absorbed £90,000, and the dividend tax was £2475, leaving £106,747 to the credit of profit and loss account.

The company output, to Sept. 30, aggregated 11,081 tons of tin oxide, which brought £1,247,808; and it had paid in dividends £435,000, or 54s. per share. An additional dredge for the deeper outer harbor is to be built as soon as practicable. No. 6 dredge has been working on the outer harbor during a part of the current year, with much better results than the boring had led the management to expect.

Bituminous Coal and Coke Production in 1918

Estimates of bituminous coal production in the United States by months during 1918 were completed on Jan. 20 and furnished to the U. S. Fuel Administration by the U. S. Geological Survey. These figures, which include lignite and coal made into coke, compared with the corresponding months of 1917, show an increase of 34,092,437 net tons for the 12 months. The figures by months are given in the following table:

PRODUCTION, IN TONS, OF BITUMINOUS COAL IN UNITED STATES IN 1917 AND 1918

Months	1917	1918
January	47,967,354	42,607,206
February	41,352,711	44,384,937
March	47,868,652	48,631,115
April	41,854,320	46,590,570
May	47,086,452	50,927,195
June	46,824,646	51,758,214
July	46,291,572	55,587,312
August	47,372,226	55,732,092
September	45,107,956	51,757,334
October	48,337,726	52,885,513
November	47,689,801	44,386,987
December	44,037,147	40,634,525
Total	551,790,563	585,883,000

The production of byproduct and beehive coke in the United States during the same years, 1917 and 1918, is given as follows:

COKE PRODUCTION, IN TONS, IN UNITED STATES IN 1917 AND 1918

Months	Beehive		Byproduct	
	1917	1918	1917	1918
January	2,923,056	2,242,362	1,787,850	1,649,819
February	2,489,888	2,234,281	1,806,773	1,562,056
March	3,138,977	2,630,433	1,813,435	2,051,206
April	2,813,935	2,580,931	1,859,278	2,021,437
May	2,861,364	2,757,719	1,879,268	2,139,204
June	2,754,897	2,712,726	1,880,335	2,092,155
July	2,753,902	2,813,910	1,882,200	2,300,673
August	2,649,755	2,657,022	1,914,450	2,387,675
September	2,727,367	2,570,238	1,918,714	2,410,798
October	2,780,436	2,611,885	1,898,192	2,563,183
November	2,677,284	2,339,197	1,899,526	2,523,746
December	2,596,687	2,255,296	1,889,259	2,562,048
Total	33,167,548	30,406,000	22,439,280	26,264,000

Anthracite Price Restrictions Removed

WASHINGTON CORRESPONDENCE

Removal of anthracite price restrictions along with the bituminous schedule came as a surprise. It had been expected that the maximum prices on anthracite would be retained until Feb. 15 or Mar. 1. The formal order suspending prices and other restrictions was not signed until Jan. 31, although the announcement that bituminous price control would be abolished was made Jan. 17. The only restrictions which were not suspended were those requiring that contracts be made subject to maximum prices, if reinstated, subject to cancellation by the Fuel Administration, and subject to requisition or diversion of coal by the Fuel Administration; those prohibiting re-consignments of coal, and those requiring shipments of coal to tidewater to go through the Tidewater Coal Exchange. The latter restrictions were retained at the request of the Railroad Administration, to avoid the possibility of congestion at ports.

Before one of the striking lessons of the war can be forgotten, the Secretary of the Interior has taken a decided step toward the establishment of power plants at coal mines and the linking up of the industrial East with electric transmission lines. The details of the plan are set forth in a letter by Secretary Lane to the chairman of the Appropriations Committee of the Senate, in which an appropriation of $200,000 is asked for investigation purposes during the fiscal year 1920.

January Pig-Iron Production

Pig-iron production during January was 3,302,260 gross tons, or an average of 106,525 tons per day, compared with 110,762 daily, or 3,433,617 gross tons in December, according to *Iron Age*. During January, 35 furnaces were blown out and only 8 blown in, leaving 323 stacks, with 104,180 gross tons' estimated daily capacity, in blast Feb. 1, as compared with 350 furnaces, of 109,675 tons' daily capacity, active Jan. 1. Ferroalloy made in January amounted to 32,787 gross tons, of which 22,383 tons was ferromanganese.

Oil-Land Development

At a recent meeting of the California Section of the American Mining Congress, D. M. Folsom presented an interesting paper on the present oil situation, paying particular attention to the influence of existing laws upon new development.

In the course of his remarks, Mr. Folsom pointed out that petroleum and its derivatives have become just as essential to America's industrial life as wheat is to the country's material existence; and that laws which interfere with its production interfere also with industrial progress. Business of the Pacific Coast is especially dependent upon a steady production of petroleum. Practically all transportation by land and by sea is by means of this fuel, and more than half of the stationary power is derived from the same source.

Under existing laws, an oil-development company has three legitimate ways in which it may secure oil lands: First, by discovery and location on vacant Government lands; second, by leasing patented land from its owners and paying a royalty in oil or money, sometimes accompanied by a cash bonus; and third, by direct purchase of patented land.

Under the first plan the operation is purely a wildcat venture, because for many years all ground showing promise of the development of oil has either been taken up or withdrawn from location. Such ground, if it exists at all, is now far from transportation. Should a company follow this course, drill a 3000-ft. hole at the cost of, say, $100,000, and strike a good flow of oil, it would discover, according to recent experience, that all land in the vicinity except its own 160 acres would be immediately withdrawn from entry. Unless the well

was a gusher, the company would find itself in trouble. With one small well and unable to secure more territory, far from transportation, the company would soon realize that its property was a liability, not an asset.

The intent of the first withdrawals of land in 1909 by President Taft was to protect the legitimate operator and to develop the various oil fields efficiently for the good of the nation, but the law has been administered in such a manner as to block development on public lands. Efficient development and operation of oil lands are possible only through the employment of a large amount of capital, the drilling of many wells, large production, ample storage capacity, cheap transportation, and refining facilities at no great distance.

Acting under the second plan, if the development company leased several tracts and succeeded in bringing in one good producer, the well would have to be extraordinarily good to be profitable. The income from such a well would be regarded mainly as profit which would be subject to the excess-profits tax of 60 to 80%, because the business was conceived and the well developed since Mar. 1, 1913. Because the risk is great in any event, and because any hoped-for profits will be more than cut in half, this second plan is not attractive.

In the third method—the acquisition of land by purchase—the purchase price may be written off over a series of years, but this does not constitute an attractive business proposition, either. No one would purchase land with the object of drilling for oil unless fairly certain that oil was present. This fact will be known to both vender and purchaser, and, the vender knowing it, the price would be high, and a large profit on the investment would be improbable.

Thus, in whatever manner prospecting work may now be undertaken, the risk is hazardous, and if fortunate strikes are made the Government gets the larger proportion of profit. The taxes on new oil industries are so large that they tend to destroy the business.

The oil industry does not object to paying its just proportion of the war debt, and, quite properly, that should be a large portion; but it should be proportional to production.

The Situation in Mexican Affairs

If President Carranza is sincere in his reported desire for a fair and amicable adjustment with the foreign owners of oil lands and mines, and if he is really in position to "make good" his promises, says the *Evening Sun* of Feb. 8, it will be an excellent thing, especially for Mexico. It is now said he means to call a special session of the Mexican Congress in April to revise the laws by exempting properties that are already being worked from the confiscatory provisions of the constitution, and by granting certain other relief measures. Doubtless the foreign investors will meet him half way, but they will need to be convinced of his sincerity.

Mexico wants capital. The opportunities are vast, and money will flow in copiously if really stable conditions can be created. Carranza proposes to refund the national debt, and expects our help toward doing it. New York capitalists have been approached, and are willing to respond—if they can feel sure of stability. It is a large "if."

There is probably some truth in the frequently made statement that the better and more intelligent classes in Mexico are more friendly in their feeling toward us than they once were. But are they in real control of their country? The situation is by no means hopeless, but it is well for our Government to make haste slowly and be sure of its facts before any adjustment of difficulties—on paper—is accepted as final.

Haig Praises R. E. Tunneling Companies

The special order by Sir Douglas Haig in the London *Times* of Dec. 5, and printed in a recent bulletin of the Institution of Mining and Metallurgy, is of great interest, in view of the number of men, mostly mining engineers, who have served in the tunneling companies. It follows:

A large number of men are now being withdrawn from tunneling companies for urgent work at home. Before they leave the country I wish to convey to the controllers of mines and to all ranks of tunneling companies, both Imperial and overseas, my keen appreciation of the fine work that has been done by them throughout the last four years.

At their own special work, mine warfare, they have demonstrated their complete superiority over the Germans, and whether in the patient defensive mining, in the magnificent success at Messines, or in the preparation for the offensives of the Somme, Arras, and Ypres, they have shown the highest qualities both as military engineers and as fighting troops.

Their work in the dangerous task of removing enemy traps and delay-action charges, on subways, dug-outs, bridging roads, and the variety of other services on which they have been engaged, has been on a level with their work in the mines.

They have earned the thanks of the whole army for their contribution to the defeat of the enemy. Their fighting spirit and technical efficiency have enhanced the reputation of the whole corps of Royal Engineers and of the engineers of the overseas forces.

I should like to include in the appreciation the work done by the army mine schools and by the Australian Electrical and Mechanical Mining and Boring Company.

Ole Hanson*

Ole Hanson is the melting pot's vindication. A native-born son of immigrant parents, there is no hyphen attached to this Seattle Mayor's title of American. An advocate of such legislation as the minimum wage law for women and the eight-hour day for both men and women workers, there was doubt in some Seattle minds about the course he would take if the labor troubles which were threatening the Washington city came to a head. They were not kept in doubt.

"This is not a strike; it is attempted revolution engineered by anarchists, Bolsheviki, and the I. W. W.," he said; and he laid a heavy hand upon the situation, with the result that the crisis there was safely passed. In a statement discussing the situation Mayor Hanson declared:

The labor unions must now cleanse themselves of their anarchistic element or the labor unions must fall. They are on trial before the people of this country. I take the position that our duty as citizens stands ahead of the demand of any organization on the face of the earth. The union men, the business men, the churchmen, must first of all be citizens. Any man who owes a higher allegiance to any organization than he does to the Government should be sent to a Federal prison or be deported.

Throughout his political career Ole Hanson has been a disciple of Theodore Roosevelt, and his words, published by coincidence on Roosevelt Memorial Day, are such as would have delighted that great American.

*Editorial in the New York "Tribune" of Feb. 10, 1919

Editorials

Developments in Copper

THE official statement about copper that was published in Washington last week was received by the public as the revelation of a bad situation, but there was nothing in it that the readers of the *Journal* had not already had, and there was one slight misstatement, viz. with respect to the fixed price for copper. We may appropriately review the main events of the last three months.

In the first place, let it be clearly established in the mind that the Government never fixed the price for copper in the sense that it named a price at which all business should be done. What it did was to fix a *maximum*, first 23½c. and later 26c., *above which* producers might not go. Producers being unwilling on any day up to Dec. 1, 1918, to sell for any less, the prices of 23½c., and later 26c., prevailed as the market prices. But if at any time producers had had more copper than they could sell at the stipulated maxima, and had desired to sell, the market price would no longer have been at the maxima, but would have been at something less. We repeatedly drew attention to this during 1918, arguing that the maintenance of the market at the restrictive maximum indicated that there was not copper enough.

A precisely parallel situation as to high-grade zinc illuminates this. There was a fixed maximum price of 12c., which prevailed as the market price so long as the supply was short, but upon a liberalizing of the specifications, letting in a new supply of high-grade zinc, the market fell below 12c. overnight, and subsequently the maximum price ceased to be a factor in the market; at any rate, not a direct factor, though it was always a threat.

Manifestly the condition as to copper and zinc was quite different from that of silver, in which case the Government *agreed to buy* the metal at a certain price, and subsequently established conditions equivalent to a maximum of $1.01⅛ and a minimum of 99⅝c. To have had real *fixing* of the price for copper, something similar would have had to be done.

On Nov. 1, 1918, a previous agreement between the War Industries Board and the copper producers was renewed for two months, without any change of terms. On Nov. 15, 1918, a new agreement was arranged, cancelling the previous one. The agreement of Nov. 15 merely meant that if the Government needed to buy any more copper (which nobody anticipated it would) it would pay 26c. for it up to Dec. 31, and up to that time the producers were authorized to enter into an agreement among themselves to ask 26c. from the public and get it if they could. The producers promptly entered into such an agreement, but promptly, also, found that they could not get the price.

A few thousand tons of copper was sold during the second half of November to the Government and its Allies, on doubtless what were belated orders, and thus established a market price. From Dec. 1 to Dec. 31, however, no copper was sold to anybody, and with the conditions existing, viz. the producers being bound to each other not to sell at less than 26c. and nobody being willing to pay anything like that, there was neither any market nor could there be said to be any market price.

With the advent of January the newly formed export association named a price of 23c. for export. Some of the small producers made sales at 21@20c., and later in the month as low as 18¾c. These sales were sporadic and but small in the aggregate, the total for the month being only about 25,000,000 lb. There was a good deal of vagueness about them, and it was impossible to determine just what they represented. The big producers did not sell anything, and with them out of the market there could hardly be said to be any market. There was no way of telling what the market would have been if copper had been freely offered by a big producer or if the small producers, in their fishing, had hooked into a real demand.

Among the big producers there was neither any collusion nor illusion, at least there was no illusion after the first week or two. The gravity of the situation, especially as to the accumulated stocks both here and abroad, and the probability that Europe would not buy any copper for a long time, was scarcely appreciated even in high quarters. Washington had contributed to dulling the perceptions by making official statements of big orders to come from Europe, which our readers will recall we characterized as moonshine at the time they were made, and persuading the producers to maintain production until Dec. 31. Our discernment of the situation here, and our advices from Europe from an early date, were contrary to all optimistic ideas, and ever since November we had been unswervingly declaring the situation and indicating to weak producers that they ought to shut down as quickly as they could.

However, as conditions became clear to the big producers during January, the shock that there would be to labor with restoration of the sliding scale of wages and a drop overnight from the basis of 26c., which had been used up to Dec. 31, to something less than 20c., became a paramount consideration. It was necessary to talk things over with the labor leaders and make some arrangements. In this both parties—the companies and the representatives of the miners—were clear-eyed and generous. The Department of Labor and other branches of the Government were intelligently helpful. During these negotiations the big producers had to avoid making a market and forcing the issue. But with the beginning of February the situation changed, and one after another appeared as a seller of copper ready to meet the market or to make a market. Thus were natural market conditions restored, and this was the most hopeful first step for the remedy of a bad situation.

There are troublesome days ahead, and they may last for a long time. We must expect a convulsive market for a while, and also we must look for lower prices being made, perhaps so low that they will be a jolt. We have a situation now in copper, as well as in lead and zinc, wherein cost of production does not mean anything in the market. Many producers will find it necessary to cease producing. The more is production curtailed, the better will it be for correction of the surfeited condition. In this connection let us point out, however, to those companies whose treasuries are in a good state—and fortunately that can be said of many—that this is a good time to resume development work, which had to be neglected during the high pressure of 1915-18. Copper producers must now be cool, patient, and philosophical, and we trust that they will accept our confident assurance that in letting nature take its course the restoration of normal, healthy conditions will come quickest.

Danger Signals

DANGER signals are flying in the delay in resuscitating the industrial consumption of commodities. Nobody possessing common-sense needs to be told what is going to happen if mines and mills and factories are closed owing to inability to sell their products. Even the railway men—those dictatorial aristocrats of labor—will become aware that there is something wrong when reduction in working forces begins owing to diminution in freight to be moved.

What is the matter? Primarily it is that we are no longer on an exaggerated war basis. Before the war the American people were estimated to be making net earnings of about $7,500,000,000 per annum. The earnings were reinvested mainly in new railways, new houses, new factories, and public improvements to meet the needs of the growing population, and it was that new construction that created a great market for commodities.

The people have to live and will buy food, fuel, and clothing at all times, but there will be mighty little buying of steel and copper and other metals and things if there be no new construction going on.

During the war the net earnings of the people rose probably to about $15,000,000,000, and the major part of it was squandered in warfare. We do not pretend that the figures that we have mentioned are much more than guesses, but they are good enough to afford some orientation. The prices of commodities and the wages for labor both doubled.

Commodities and labor still stand at high figures, but quotations do not mean anything if goods are not being sold and if labor be unemployed. If business could be got going in a normal way tomorrow, there is no reason to estimate that the net earnings of the people in 1919 would be any more than they were in 1914; certainly not if the production of things recedes to the rate of five years ago, which seems not unlikely.

But we are still incurring war expenses. We are feeding and clothing a large army, maintaining a large navy, paying big bills for bringing the soldiers home, building ships, and doing much other work, started during the war, that could not be stopped. We have got to meet a big tax bill this year and another huge loan. When the war bills are defrayed out of the diminished earnings of the people there is not going to be much left for new houses and railways. The people will have to continue to crowd for some time longer. True, we are in a strong financial position, and can furnish a great buying power out of resources and credit, and, fortunately, we can lend a lot of money to Europe for her to buy of us (which we shall have to do), but neither Europe nor ourselves are going to capitalize new constructions at inflated prices. It would be folly to do so.

Hence is it that buying halts. The one way to start it is to let nature take its course, and by that we mean to remove all impediments from the markets and let them find their own levels. Representations that reduced prices will not stimulate buying are buncombe, closely related to the silly talk of a while ago that high prices would not check consumption and the mad doctrines about repealing the law of supply and demand.

Congress can help more than anybody or anything else by promptly passing a law that would liberate the wheat market.

The steel magnates can help by declaring a wide-open market in iron and steel, which sooner or later they will have to do anyway.

Bureaucrats, who linger on the stage and are doing some belated interfering with market conditions, can help by keeping their hands off.

Labor leaders can help by facing squarely the facts that economic laws are in action that nobody can resist.

We were astounded last week to read in the newspapers that high officers in the Government are meditating a plan for some more price-fixing. They want to arrange a sort of an economic ladder so as to bring things down gradually and equally. We have had too much of price-fixing. That is one of the main troubles now. The one thing for Washington to do now is to keep its hands off in the matter of markets and prices. The last proposition would be what the New York *Sun* tersely described as "the touch that is death."

The price for the dislocation and destruction of the war had to be paid anyhow. Added to the price is the penalty for the economic crimes that were committed. To Congress, magnates, bureaucrats and labor leaders we reiterate that danger signals are flying. If they be heeded, it will not be too late. If not heeded, no one can foretell the consequences.

There is one other great obstacle to readjustment, and it may be the greatest of all. This is the delay of the conference in Paris to make peace. This is a time when action is necessary, not the debating of abstract ideas and ideals.

Havoc Wrought by Germans at French Mines

THE seizure by Germany of the French coal fields about Lens, during 1914, marked but one step in her attempt at world domination. Knowing well that there was slight probability of her being able to hold the territory permanently for commercial purposes, the wanton destruction which has characterized Germany's type of warfare was brought into action, with the result

that the once-prosperous coal fields are today a mass of ruins. Under "Havoc Wrought by Germans at French Mines," we reproduce a continuation of the photographs which appeared in the *Journal* of Feb. 1. As may be seen, the construction of headframes and buildings was of steel and masonry, and of an advanced type. The expense necessary for the complete rehabilitation of the industry will be enormous; practically nothing of salvage value is left.

The district, covering an area of 400 square miles, produced about 70% of the coal mined in France, which is mostly bituminous and of good quality. The seams, for the most part, lie at depths ranging from 1000 ft. to 3000 ft. and vary from 2 to 25 ft. in thickness. The long-wall system of mining was practiced extensively in the thinner beds, and considerable timbering was necessary, owing to the weakness of the roof.

For Americanization

THERE was recently presented in Congress a bill (S. 5464) the object of which is to eliminate illiteracy in the United States. Briefly stated, the purpose of the bill is to promote the education of native illiterates and those unable to use the English language, through the coöperation of the Federal Government and state educational departments, with the aim of preparing both classes for successful living and intelligent American citizenship.

We do not argue for the passage of this particular bill or all of its provisions, but we do wish to express our earnest support of its object.

The United States occupies its present prominent position in the industrial world largely because of the small percentage of her illiterate citizens, and the reduction of this small percentage to the vanishing point would go a long way toward converting our prominent position to a dominant one. Though we may congratulate ourselves upon our record as to illiteracy, we are handicapped as is no other country by the large percentage of our workers who do not speak our tongue. This is particularly noticeable among the mines both in the East and in the West, where many of the unfortunate situations that arise, if not caused by the lack of an understanding of English by the workmen, certainly grow out of that circumstance and are difficult to handle because of that lack.

Born and raised under suppressive European conditions, and suddenly translated to a land of unlimited liberty and opportunity, but with no real knowledge of the country and no knowledge at all of our language, it is impossible for the immigrant miner quickly to grasp and appropriate the American spirit. With all repression removed, he is likely to go too far. He resembles a boiler carrying a pressure of 250 lb. and capable of doing a lot of work if its energy is properly handled. If the valve is suddenly thrown wide open, there is a rush of steam, and all of the latent energy is wasted through its sudden release.

The bill mentioned calls for a six years' program. It is conceivable that the major portion of our illiterate minors between the ages of 16 and 21 might be given a rudimentary education during that period, but the teaching of English and American life to foreign-born residents is a task that will be with us for many years, so that some provision should be established for making continuous the work of educating foreign classes. The fact that so many of us are not good American citizens has been particularly emphasized during the last three or four years. The trouble has been here all the time, but we were so busy about other things that we did not bother with it, nor did we realize how serious a matter it would become. In the program of reconstruction, the elimination or reduction of this condition should receive prompt, vigorous, and greatly needed attention.

Ability to converse with our employees means the ability to give orders that will be understood; it means the possibility of exchanging ideas, the possibility of conveying the American point of view to one who has had no conception of it; it will enable the employer and employee to approach each other through a common medium; it presents the probability of removing misunderstandings.

We will always have some illiterates; we will always have many workers who cannot speak English; but we may aim high and hope for much of the improvement that we know is possible.

We trust that our legislators will give the subject of this bill serious consideration, and that they may find a suitable way in which to coöperate with the states in a practical endeavor to make good American citizens of all the people who by accident or intent have elected to live in our country.

Disillusionment

WE FELL asleep at our desk yesterday and had a dream. We saw ourselves commuting into town in a comfortable car, on time and unjostled, with no unlucky fellow standing in the aisles, leisurely opening the morning paper. And on the first page was headlined that the President had cabled this message:

"To all officers of the Government: The several chairmen of the metals producers' committees (here followed the names, which we omit) are hereby appointed to take charge of the liquidation of the Government's stocks of metals in both manufactured and unmanufactured forms. All officers of the War, Navy, and all other departments will immediately cease all actions on their own accounts, will take prompt steps to ascertain what stocks the Government owns, will report same to the several chairmen, and will leave the further management of the business to them. If the chairmen, out of any delicacy, are unwilling to accept this appointment, they are authorized to delegate the business to an administrative committee of three men, experienced in the metal trades and unassociated with any commercial interest therein, upon whom they may agree. The sole purpose of this order is to get the liquidation of the stocks into experienced hands."

We had got so far, and were thinking what a fine thing this would be, and how it would promote the readjustment of troublesome things and be so greatly to the national interest, when Mr. McAdoo's engine driver inadvertently put the brakes on too hard, jolted us awake, threw the man who was sitting on the arm of the seat over upon our shoulder, and we became alive once more to the grim realities of a world in chaos.

BY THE WAY

The Government is shipping coal to Alaska for its own railroad, which has been built largely for purposes of developing the great Matanuska coal fields, it was stated in Seattle on Jan. 9. An order has been placed with the Alaska Steamship Co. to deliver a full cargo at Seward for use on the railroad and in the machine shops.

"Two of the richest countries in the world are Mexico and Russia," says Charles W. Barron, in the *Boston News Bureau.* "One is the richest country in minerals and the other the richest in possibilities of agriculture. Both of these countries have been bedevilled by poison I. W. W. socialism that would put hands and feet at the top and the head underneath, upturning all government and order."

The mill with which the —— Mining School is equipped marks the highest point toward which the world's metallurgists have attained, writes a contributor to a Canadian contemporary. The plant and machinery designed and installed by men who have attained to the height of the profession of mining and metallurgy, is among the most modern and flexible ever constructed. —Some height, we would anticipate.

Mexican silver dollars, the purest of silver coins, are being converted into bullion by their holders in order to take advantage of the price of silver, stated a correspondent recently in the *Economist;* and the only silver money left consists of 50-cent pieces, which are, or were recently, at a premium of 8%. The government is considering the issue of token coins in silver or a baser metal, and, meanwhile, is coining gold pieces of 2½ pesos, which are inconveniently small. Two-peso gold pieces are also to be issued, and it may be difficult to avoid confusing the two.

Aladdin's lamp would probably be listed in the *Patent Gazette* as an oil device. An invention that would fall in the same category plays a part in a lawsuit recently reported in the New York *Tribune.* More than $3,000,000 and a device to discover oil pools, described as a "radium device," are involved in this suit for $600,000, which was filed on Jan. 25 in the Supreme Court by Dr. Hugo J. von Hagen against Karl J. Schumacher. Dr. von Hagen, owner of the "oil finder," alleges that he agreed with Mr. Schumacher in May, 1917, to allow him the use of the magic instrument, the plaintiff to receive one-sixth of the sum realized from the discovery of oil tracts, which, the inventor says, has amounted to more than $3,000,000. Dr. von Hagen alleges that oil was discovered on 20 different tracts, covering 23,704 acres of land, in Texas, Pennsylvania, Oklahoma, and Kansas.

Speaking of the way Dr. F. G. Cottrell's mind works, Buckner Speed, in a recent issue of *Journ. Ind. and Eng. Chem.,* says: "I recall about 12 years ago, when he was working on the precipitation of smelting smoke, I asked him for help on what seemed to be scarcely an allied problem, the freeing of California crude oil from its emulsified water. Instantly his mind worked with a snap. 'Why,' he said, 'it's the same problem. For air put oil; for smoke particles, the minute water particles,' and then his favorite form of expresion: '*What will happen* if we put a high electrostatic stress on the oil?' Then in his characteristic quick manner, in a few minutes there were thrown together a beaker of oil, a spark coil, and two pieces of copper, and lo, the de-emulsification of the California oils had been solved. Within a few minutes on a block of paraffin under the microscope there was spread out a drop of the emulsified oil, with two electric wires touching its edges. When the spark coil was put in operation the water drops were seen to arrange themselves in the field of the microscope like the iron filings between the poles of the magnet, to dance about and jiggle themselves into larger drops; and in these few minutes of experimentation the problem was solved by which millions of barrels of unmerchantable California oil were rendered fit both for refining and for fuel purposes. It was a familiar phrase to be heard in the University of California anywhere from the botany to the physiology departments when any question of any description came up: 'Oh, go over and talk to Cott about it. He doesn't know anything about the subject, but he will put some idea in your head before you have talked with him 10 minutes,' and this he invariably did."

Playin' Tha Game

By D. E. Charlton

M'son, w'en thee's talkin' o' minin'
An' methods o' 'andlin tha h'ore,
Did thee ever jus' sit down an' figger
W'ot thee needs mos' of all, an' befor'
Thee can start with sinkin' or driftin',
An' naw tha fine points o' tha game,
W'y there's one thing thee's boun' to remember,
'An thee'll fin' it worl' over tha same?

There's tools, an' there's pumps, an' there's h'engines,
An' h'office, an' ware'ouse an' shop;
So it gaws, thee can count without nummer,
An' thee's jus' made a start at the top.
Then figger tha price o' tha labor
An' extras an' such that's thrawn in,
Then, m'son, thee can add up tha total,
An' thee'll fin' w'ot it costs to begin.

Now, dam-me, it starts me to thinkin',
If I 'ad tha money to spare,
An' wuz puttin' tha mos' o' my fortun'
In a 'ole w'ere I 'ad to play fair
With tha chaps I 'ad as my partners,
I think that I'd see tha job through,
An' see to it they got w'ot wuz commin',
An' I naw that's w'ot mos' men would do.

Some men, I'll h'agree with thee, sonny,
Ain't h'earned not a single day's pay.
There are h'others, an' thee'll not gainsay me,
'Ave worked 'ard an' 'ave put un away.
Now these chaps for 'oo we are workin'
'Ave 'ad their 'ard knocks an' they naw
That they're playin' tha game as they see it.
It's as square as they make it in law.

So, stop this 'ere fussin' an' grumblin',
An 'elp 'ere a bit with tha set.
'Ow in 'ell do thee 'ope to make wages
If thee does nothin' more than jus' fret?
It all simmers down to tha question
As to 'ow far thee's willin' to gaw.
An' there's this 'ere thee's boun' to remember—
Give tha bes'—an' tha super, e'll naw.

NEW PUBLICATIONS

Methods of Shutting off Water in Oil and Gas Wells. By F. B. Tough. Pp. 122, illus. Bull. 163, U. S. Bureau of Mines, Washington, D. C.

The Oxidized Zinc Ores of Leadville, Colorado. By. G. F. Loughlin. Pp. 87, illustrated. Bull. 681, U. S. Geological Survey, Washington, D. C.

The Geology and Coal Resources of Buchanan County, Virginia. By Henry Hinds. Pp. 278, illus. Bull. 18. Virginia Geological Survey, University of Virginia, Charlottesville, Va.

Preparation of Crucible Graphite. By George D. Dub. War-Minerals Investigations Committee's Pamphlet No. 3, U. S. Bureau of Mines.

This report describes graphite investigations made by the Bureau of Mines in connection with the War-Minerals Investigation Committee, and presents information and facts in connection with the industry.

Efficiency in the Use of Oil Fuel. A Handbook for Boiler-Plant and Locomotive Engineers. By J. M. Wadsworth. Pp. 86; illus. U. S. Bureau of Mines, Washington, D. C.

This compendium is intended as a handbook of information for the man familiar with the use of oil fuel. The data given are compiled by the Bureau of Mines from its own investigations and from those of leading authorities in coöperation with the U. S. Fuel Administration.

Rock Quarrying for Cement Manufacture. By Oliver Bowles. Pp. 160, illustrated. Bull. 160, U. S. Bureau of Mines, Washington, D. C.

This bulletin is the fourth of a series of reports by the Bureau of Mines on different phases of quarrying in the United States. The first part of the bulletin describes the chief types of cements, the growth of the cement industry in this country, and the character of the raw materials used. The bulk of the report deals with quarrying methods and equipment, and gives especial attention to drilling and blasting. A chapter on rock mining and one on prospecting are included. Methods of manufacture are mentioned briefly, as that subject, except as related to quarrying, lies outside the scope of this report; but transportation methods and the effects of the manner of mixing the materials at the quarry or crushing plant on quarrying methods are discussed.

California Mineral Production for 1917. By Walter W. Bradley. Pp. 179, illustrated. Bull. 83, California State Mining Bureau, San Francisco, Calif.

It is the endeavor of the staff of the State Mining Bureau in these annual reports of the mineral industries of California to so compile the statistics of production that they will be of actual use to producers and to those interested in the utilization of the mineral products of the state, at the same time keeping the individual data confidential. In addition to the mere figures of output, the bulletin gives descriptions of the uses and characteristics of many of the materials, as well as a brief mention of their occurrences. Some of the data relative to properties and uses of many of the minerals described are repeated from preceding reports, as it is intended that this annual statistical bulletin shall be to a degree a compendium of information on California's commercial minerals and their utilization.

Thirty-Ninth Annual Report of the Director of the U. S. Geological Survey to the Secretary of the Interior, for the Year Ended June 30, 1918. Pp. 163, illus. U. S. Geological Survey, Washington, D. C.

A detailed and classified account of the activities of the U. S. Geological Survey during 1918. The contents of professional papers issued are summarized in a manner which facilitates reference. A notable proportion of the work done during the year was in connection with war needs. Charts are given to show the details of such work; and, in this connection, it is refreshing to note that the credit claimed of having taken an active part in the investigation of special war problems is well deserved. Also, the achievements in this field are modestly recorded and with a minimum of pretension.

American Methods in Foreign Trade; a Guide to Export Selling Policy. By George C. Vedder. 5½ x 8¼, pp. 204. McGraw-Hill Book Co., New York.

The author maintains that the imperialistic business principles of the German method for development of foreign trade are fundamentally wrong, and that although success apparently attended the German system, the method would, in time, bring about its own destruction. Nationalization of foreign trade, he believes, is contrary to good business principles. Business of a permanent nature rests solely on the merits of the goods produced. The development of business may be slow where merits of goods are depended upon to make sales, but such business becomes permanent. Manufacturers should not lower the quality of goods in order to meet competition, as the practice leads only to transitory business, of no advantage to producer or consumer. The author believes that the principle of the Webb-Pomerene act is wrong, that either it or the Sherman law should be repealed, and that our home laws should square with our foreign practice. The proper use and duties of export commission houses, export selling agents, and export managers are fully discussed, as well as selling plans and the making of markets. Foreign credits and banking are studied, and considerable space is devoted to government relations in foreign business. The book will be found to be useful to manufacturers who are new to the foreign market, and it also contains some valuable hints for those who have already done business abroad.

Sulphur Dioxide Method for Determining Copper Minerals in Partly Oxidized Ores. By Charles E. Van Barneveld and Edmund S. Leaver. Pp. 14, illus. Technical Paper 198, U. S. Bureau of Mines, Washington, D. C.

This pamphlet describes a series of investigations undertaken in consideration of the need for a correct and rapid method for the selective determination of the quantity of copper in the sulphide form on the one hand, and in the form of combined oxides, carbonates, silicates and native or metallic copper, on the other, in partly oxidized ores and in the mill products resulting from the crushing and treatment of these ores. The conclusions reached with reference to the sulphur dioxide method may be summarized as follows:

(1) Cuprite, melaconite, malachite, azurite, chrysocolla, and fine metallic copper are dissolved rapidly and completely.

(2) Chalcocite and chalcopyrite are not affected.

(3) Metallic iron in ordinary quantities, even up to 2%, dissolves rapidly and has no effect on the determination, provided there is a strong excess of SO_2, introduced as SO_3 solution.

(4) There is no gelatinization of silica and the possible loss of copper from this cause, noted in analyses by the other methods described, is eliminated.

(5) The method is applicable alike to high-grade and to low-grade ores. The manipulation is simple and the possible sources of error are few. One chemist can keep a six-unit electrolytic outfit working to full capacity on porphyry ores.

(6) Crushing fine enough to liberate completely the mineral particles is essential. Ores containing an appreciable proportion of chrysocolla should always be pulverized to 150 mesh.

(7) Any metallic copper present as flakes or large particles would, of course, be removed during the preparation of the sample and treated as scales. Fine metallic copper remaining in the pulverized sample would be dissolved and reported with the metallic copper. If a separate determination of metallic copper is considered necessary, this can be made by amalgamation, preferably in an amalgamated copper pan.

Personals

Have You Contributed to the Association of the 27th Engineers?

P. G. Spilsbury has been in the Lordsburg district of New Mexico on professional business.

James B. Pearce has recently been appointed engineer for the Inspiration Consolidated Copper Co., at Miami, Arizona.

J. P. Hutchins, consulting mining engineer, expects to sail Feb. 17 for Southern Russia via. London, the Mediterranean, and Constantinople.

Cecil A. Fitch, superintendent of the Chief Consolidated Mining Co., and **Walter Fitch, Jr.,** of Walter Fitch, Jr., Inc., were in New York recently.

W. H. Aldridge has accepted the position of president for the Texas Gulf Sulphur Co. The company's mine at Matagorda, Tex., is now nearing production.

Arthur W. Burgren, mining engineer, has returned to Matehuala, S. L. P., Mexico, where he is employed by the American Smelting and Refining Company.

Chester B. Neiswender, formerly chemist for the Pacific Mines Corporation, Ludlow, Calif., is now with the concentrator department of the Inspiration Consolidated Copper Co., at Miami, Arizona.

J. W. Crowdus, engineer, recently discharged from the service, has returned to his consulting practice in El Paso, Tex. As first lieutenant of engineers, he was attached to the General Staff Mechanical Section, Division of Purchase, Storage, and Traffic, at Washington.

Frank R. Wicks, consulting engineer, recently resigned as superintendent of mills for the Chino Copper Co., at Hurley, N. M., and has opened an office at 404 Union Oil Bldg., Los Angeles, Calif., where he will specialize in concentration and flotation, crushing and fine-grinding problems and plant management.

W. F. Kohagen, formerly private secretary to **M. H. Godfrey,** district manager for the Oliver Iron Mining Co. at Hibbing, Minn., has been appointed assistant superintendent of the Burt, Sellers, Morris and Philbin mines in that district. **John McDowell,** superintendent of these properties, is now in Florida.

Judd Stewart has resigned from the American Smelting and Refining Co., with which he had been associated since its inception, and in recent years had been one of its chief officers and a member of its board of directors. Mr. Stewart has been associated continuously with the silver-lead smelting business for over 36 years, beginning Jan. 1, 1882, at Argentine, Kan. He has been a valuable factor in the organization and systematization of methods in some important branches, and his retirement is a real loss to the industry in its broadest sense.

Obituary

James Cumming, one of the pioneer mining men of the Canadian West, died at Vancouver, B. C., Dec. 3, 1918.

Frank Henry Husted, mining engineer, manager of the New London copper mines east of Frederick, Md., died Feb. 3, aged 53 years.

Ernest L. Godbe, of Salt Lake City, Utah, died at Bath Lake, Calif., Jan. 16. He specialized in chemistry and metallurgy, and for many years was engaged in mining, in the Pioche, Nev., district, having been vice-president of the Prince Consolidated Mining and Smelting Co., up to a few years ago. He was 51 years old.

Frank G. D. Smith, superintendent of the silver refinery at the East Chicago, Ind., plant of the United States Metals Refining Co., died of complications resulting from influenza, Jan. 20. For some time prior to 1916, he was manager of the Santa Domingo Silver Mining Co., at Batopilas, Chihuahua, Mexico, but revolutionary activities made it impossible to continue operations there.

Hubert Ingersoll Ellis, mining engineer, died Jan. 6 in eastern Washington. He was born in June, 1889. In 1905 he entered the College of Mines, University of Washington, where he remained about three years. He then went to Alaska and engaged in mining. In 1915 Mr. Ellis took a position as underground miner for the Bunker Hill & Sullivan Mining and Concentrating Co., at Kellogg, Idaho, but was soon promoted to the position of operative on experimental metallurgy and later to that of chemist. He was a member of the American Institute of Mining Engineers.

Alan Fraser McCormick, assistant superintendent of the El Paso Smelting Works, of the Consolidated Kansas City Smelting and Refining Co., El Paso, Tex., died of pneumonia on Dec. 23, 1918, aged 43 years. He was born in the Province of Ontario, Canada, and began his career in the smelting business about 20 years ago at Trail, B. C. From there he went with the Granby Consolidated Mining, Smelting and Power Co., and subsequently was connected with mining companies in Montana. In 1911 he became assistant superintendent in charge of copper reverberatory smelting and converting operations at the El Paso Smelting Works, where he remained until the time of his death.

Societies

Engineering Council will hold its annual meeting on Feb. 20 at the Engineering Societies Bldg., 29 West 39th St., New York.

Utah Society of Engineers and the local sections of the American Institute of Mining Engineers, the American Institute of Civil Engineers and the American Institute of Electrical Engineers recently held a banquet, at which the consolidation of the branches of the engineers' societies was discussed.

Founder Societies held a joint meeting Feb. 10 at the Engineering Societies Bldg., 29 West 39th St., New York. The delegates to the Joint Engineering Congress held in Paris, who recently returned to New York, spoke informally on matters relating to the work of that congress, and on general conditions in France.

American Society of Civil Engineers held a meeting Feb. 5 at the Engineering Societies Building, 29 West 39th St., New York. Francis Lee Stuart, late chairman of the budget committee of the Eastern railroads, spoke on "The National Railroad Situation of Today and a Suggested Basis for Legislation." The subject was thoroughly discussed by those present.

American Institute of Mining Engineers, Montana section, held its sixth annual meeting at the Silver Bow Club, Butte, Mont., on Feb. 7, when officers were elected. A technical session was held immediately after the election and included the following: "The Metallurgy of Aluminum and Magnesium," by Prof. H. B. Pulsifer; and "The Manufacture of High Explosives and Their Use in Metal Mining," by J. C. Horgan, of the Du Pont Powder Company.

Chemical Alliance, Inc., is to be continued in its present form. Though the organization was created for war purposes, it has demonstrated its usefulness to such an extent that the members are unanimous in desiring its continuation. The officers for the coming year are: Horace Bowker, president; Henry Howard, vice-president; and J. D. Cameron Bradley, secretary-treasurer. The directors are Horace Bowker, Henry Howard, E. R. Grasselli, A. W. Hawkes, W. D. Huntington, D. W. Jayne, A. D. Ledoux, F. A. Lindbury, C. H. MacDowell, J. D. Pennock, C. L. Reese, Donald I. McKisson and C. G. Wilson.

Industrial News

Aspromet Co., Pittsburgh, Penn., has opened a sales office in the Schmulbach Building, Wheeling, W. Va., under the direction of E. A. Short.

Powdered Coal Engineering and Equipment Co., Chicago, Ill., announces that John F. Nealis, recently discharged from the Aëro Observers' branch of the service, has now entered its employ as advisory engineer. Lester E. Armstrong, recently in the Air Service, has also accepted a position with the company as advisory engineer.

Matthew Addy Co., engaged in marketing alloys, pig iron, coal, and coke, celebrated its sixtieth anniversary Jan. 29. A dinner was given at the Queen City Club, Cincinnati, Ohio, at which James A. Green, president of the company, presided. In a speech he reviewed the business history of the company and told how Matthew Addy, now deceased, had requested his associates to carry on the business in his name, and provided adequate capital for that purpose, which capital was soon repaid in full to the estate.

New Patents

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Drilling Holes, Method of. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Co., Claremont, N. H. (U. S. No. 1,286,994; Dec. 10, 1918.)

Dumping-Car Door. Clarence H. Williamson, Altoona, Penn. (U. S. No. 1,287,548; Dec. 10, 1918.)

Electrolytic Apparatus for Producing Tin Fluosilicate Electrolytes. Robert L. Whitehead, Perth Amboy, N. J. (U. S. No. 1,287,156; Dec. 10, 1918.)

Flotation, Separating Minerals by. Anson G. Betts, Stockhouse, N. C. (U. S. No. 1,286,922; Dec. 10, 1918.)

Fuel and Process of Forming With Anthracite Culm and Pitch. Donald Markle, Hazleton, Penn. (U. S. No. 1,287,382; Dec. 10, 1918.)

Furnace, Annealing. Thaddeus F. Baily, Alliance, Ohio, assignor to Electric Furnace Co., Alliance, Ohio. (U. S. No. 1,286,908; Dec. 10, 1918.)

Furnace, Regenerative. Thaddeus F. Baily and Frank T. Cope, Alliance, Ohio, assignors to Electric Furnace Co., Alliance, Ohio. (U. S. No. 1,286,907; Dec. 10, 1918.)

Furnace Shields To Protect Workmen When Repairing. James R. Rishebegar, Braddock, Penn. (U. S. No. 1,287,104; Dec. 10, 1918.)

Hoisting-Engine Control. Ilion Ilieff, Washington, D. C. (U. S. No. 1,288,597; Dec. 24, 1918.)

Hydrofluoric Acid, Production of. Edwin Stanton Fickes, Pittsburgh, Penn. (U. S. No. 1,288,400; Dec. 17, 1918.)

Manganese Peroxide, Process of Preparing. Morduch L. Kaplan, Brooklyn, N. Y. (U. S. No. 1,287,041; Dec. 10, 1918.)

Metallurgical Process. John Tyler Jones, Pittsburgh, Penn., assignor to Thomas J. Howells, Pittsburgh, Penn. (U. S. No. 1,288,422; Dec. 17, 1918.)

Mine-Car Dump, Rotary. John H. D. Petersen and Albert J. Savers, Chicago, Ill., assignors to Link-Belt Co. (U. S. No. 1,287,093; Dec. 10, 1918.)

Ore Dressing—Apparatus for Clearing Clayey Ores. Edward F. Goltra, Thomas S. Maffitt and Jesse D. Dana, St. Louis, Mo., and Robert W. Erwin, Waukon, Iowa, assignors, by mesne assignments, to Mississippi Valley Iron Co., Wilmington, Del. (U. S. No. 1,288,404; Dec. 17, 1918.)

Potash—Process of Obtaining Potassium Chloride From Brines. John W. Hornsey, Summit, N. J., assignor to General Reduction Gas and Byproducts Co. (U. S. No. 1,288,592; Dec. 24, 1918.)

Potash—Process for Rendering Water-Soluble the Potash in Cement-Mill Dust. Albert R. Merz, Washington, D. C. (U. S. No. 1,288,437; Dec. 17, 1918.)

Potash—Process for Separating Borax and Potassium Chloride. John W. Hornsey, Summit, N. J., assignor to General Reduction Gas and Byproducts Co. (U. S. No. 1,288,591; Dec. 24, 1918.)

Potash—Process for Separating Salts from a Mixture of Salts in Solution. John W. Hornsey, Summit, N. J., assignor to General Reduction Gas and Byproducts Co. (U. S. No. 1,288,593; Dec. 24, 1918.)

Potash — Process of Recovering Potassium Chloride from Saline Waters. George B. Burnham, Berkeley, Calif. (U. S. No. 1,286,932; Dec. 10, 1918.)

Rock Drills, Steel Puller for. Earl M. Bruner, Denver, Colo. (U. S. No. 1,287,209; Dec. 10, 1918.)

Shaft-Kiln. Arnold Steiger and Wilhelm Steiger, Zurich, Switzerland. (U. S. No. 1,287,505; Dec. 10, 1918.)

Steam-Shovel Bucket. William G. Wood, San Francisco, Calif., assignor of one-half to Frank B. McKevitt, Sacramento, Calif. (U. S. No. 1,287,165; Dec. 10, 1918.)

Steel Alloy Containing C, Cr, V and Mo. Joseph W. Weitzenkorn, Washington, Penn., assignor to Electric Reduction Co., Washington, Penn. (U. S. No. 1,287,153; Dec. 10, 1918.)

Well Drilling, Sand Point for. Edward Master, Neosho, Saskatchewan, Canada. (U. S. No. 1,288,100; Dec. 17, 1918.)

Zinc, Refining of. Guy Carey Fricker, Luton, England. (U. S. No. 1,287,949; Dec. 17, 1918.)

Editorial Correspondence

SAN FRANCISCO, CALIF.—Feb. 7

Eight Fatal Accidents in the two months from Oct. 12 to Dec. 12, 1918, are reported by the mining division of the California Industrial Accident Commission. Of these five were caused by falling ground, one fatality resulted through a misfire, one man was crushed by a dredger mast, and one died of shock from blood poisoning.

The Suit Against the Santa Fe for cancellation of lease on Midway oil lands has been dismissed, and J. W. Jameson and W. J. Wramplemeier, it is reported, will accept the $1,500,000 long ago tendered in settlement of the claims. Delay in acceptance of this amount is said to have been due to the danger of jeopardizing larger claims. The amount recovered was due on royalties.

The Metals Exploration Co., of New York, has taken over the controlling interest in the Gold Point Consolidated Mines, Inc., in the Grass Valley district, Nevada County, Calif. The recent purchase by the Gold Point of the Idaho-Maryland and the Eureka mines has added valuable holdings to the Union Hill and South Idaho, controlled and operated for the last four years by the Gold Point interests, under the management of Errol MacBoyle, mining engineer, Hobart Bldg., San Francisco. Under Mr. MacBoyle's practical direction and constant attention the Union Hill particularly was re-opened and developed not only as a gold producer, but as a large producer of scheelite, an uncommon occurrence in the state. The situation of the Union Hill and the South Idaho in relation to the Eureka-Idaho-Maryland, and the past history of the latter mines, made a consolidation of all these properties desirable for operation on a large scale. The possibilities of this combination attracted Bulkeley Wells, vice-president of the Metals Exploration Co., and there was no great delay, except that occasioned by the interference of war conditions, in investigation and investment. Mr. MacBoyle's associates in the development of the properties were F. W. McNear, F. W. Snook, S. S. Lowery, Roy H. Elliott and Edwin Letts Oliver, who formed the Gold Point Consolidated. The present directors of the company, recently chosen, are Bulkeley Wells, Errol MacBoyle, Rufus Thayer, F. W. McNear, John McCrossen, Roy H. Elliott and Edwin Letts Oliver. Mr. MacBoyle will also serve the company in the position of consulting engineer. The original purchases, additional acquisitions, and development of old ground and exploration of new have brought the total investment in the undertaking to date close to $1,000,000. But the entire holdings cover an area extending for a distance of two miles adjoining the eastern side line of the town of Grass Valley, a territory that has produced more than $20,000,000 and containing a large amount of virgin ground. The plans of the present operators include the continuation of development at Union Hill, and, as soon as conditions are again normal in gold mining, the Eureka-Idaho-Maryland will also be developed at depth by a central shaft, the site of which has already been tentatively selected. The geographical and topographical situations of these properties conform to the possibility of economical development and operation on a scale in accordance with the practice of the other great mines in the district.

PHOENIX, ARIZ.—Feb. 7

Abolition of the Use of Fuses in Blasting is called for in one of the bills introduced early in the present Arizona Legislature. Provision is also made in the same bill for equipping every mine with apparatus for firing blasts by electricity.

The Copper Queen and Calumet & Arizona companies are continuing their efforts to establish their men in homes of their own and offer to provide a site and building money, repayable by employees in 100 monthly installments, with interest at 6%. To this end, another addition has been laid out to the town of Warren. Grading, laying of sewer and water mains, and installation of electric lighting and telephones are being pushed on the addition.

The United Verde Copper Company at Jerome shows full faith in the future in its plans made in anticipation of the expected revival of the copper industry. Oil fuel is to be succeeded by pulverized coal, handled in a crushing plant that will cost $500,000. It will be similar to that at the nearby Extension works, but with five times its capacity. A Cottrell dust collector will be installed, to avoid present complaints of damage to vegetation. Twelve eight-hearth roasters are to be added to the 12 smaller roasters now handling 1200 tons a day. The fine-crushing plant is to be moved to the smeltery from the mouth of the Hopewell tunnel, now decided to be the wrong site. It will be enlarged to 3000 tons' daily capacity. Three reverberatory furnaces are to be added at Clarkdale. In the mine, at Jerome, the new No. 5 shaft, concreted, is being operated to the 2300 level, and plans are being made for a sixth shaft of two compartments, for men and material only, equipped with an immense balanced cage for the workmen or a regular passenger-elevator system. Ventilation is to be bettered by the placing of an immense fan on the 1000 level, at the junction of the Hopewell tunnel and No. 4 shaft. There is to be underground machine shoveling by means of a Marion shovel, operated by compressed air or electricity, instead of steam, and with a bucket of ¾-cu.yd. capacity. Within a month the broad-gage railroad will be completed from the mouth of the Hopewell tunnel to the 500 level, when a big Marion steam shovel will be hauled up the hill to start work on the hillside back of the old smeltery. As the ground on which they stand will be removed as ore, the office, shops and power house are to be moved to new buildings.

BUTTE, MONT.—Feb. 9

A Strike in the Butte District ordered by the I. W. W. at a meeting in Butte on Feb. 7 resulted in practical suspension of mining in this field. The strike followed the announcement on Feb. 6 by the Anaconda company of a wage reduction at the Great Falls and Anaconda smelteries. The new wage scale announced is a reduction of $1 a day from that recently paid. The I. W. W. are demanding $6 for a six-hour day though no demands have been presented to the companies. Several hundred strikers picketed the approaches to the mines, turning back miners who wanted to work. Such pickets were mainly foreigners, Finns predominating. Work proceeded at some mines where repairs are under way, though the forces employed were reduced. The companies are said to be doing all they can to maintain operations, in spite of the fact that with metal prices as they are producers can operaate only at a loss. Entrances to the mines are being guarded to prevent any attempts at destruction. Several hundred U. S. troops with many civilians are so employed.

The Injunction Against Butte & Superior restraining it from using the oil flotation process will stand without modification, according to a decision handed down on Feb. 4 by U. S. District Judge George M. Bourquin at Helena in the case of Minerals Separation against Butte & Superior, in denying an application of the latter for a modification of the injunction. This leaves the status of the case the same pending a decision by the U. S. Supreme Court. The original ruling of Judge Bourquin in the case was overruled by the Circuit Court of Appeals, and, based on the decree of the Circuit Court, Judge Bourquin granted the injunction. The Circuit Court fixed the ratio of oil required in the process as 0.1%. Butte & Superior asked that the injunction be modified to establish a minimum amount instead of merely an average or standard ratio. "Herein defendants' motion to modify injunction is denied," says Judge Bourquin's decision. "This court in its decision did not set a lower limit of oil used in operating the patent process; in reversing that decision, the Circuit Court of Appeals set no lower limit, although it ambiguously indicates there might be one short of the smallest appreciable amount of oil. The decree sets no lower limits and virtually demands that the injunction set no lower limit. The injunction follows the decree. In any case, it is believed the injunction must be held intact until such time as the appellate tribunal defines a lower limit of oil." Butte & Superior has been trying to secure court permission to use less than one-half of 1% of oil to the ton of ore treated by flotation. The original injunction relative to the amount of oil used by Butte & Superior was fixed by court at not less than 1% of oil to the ton of ore handled by flotation. A modification of a higher court reduced the minimum to one-half of 1%. This protects the Minerals Separation Co. on all quantities of oil from one-half of 1% downward. Butte & Superior recently petitioned the Federal Court of Montana for a modification of the injunction, so that it might use as little as 0.02% of oil to the ton of ore, but Judge Bourquin refused to grant the plea, as stated above.

WALLACE, IDAHO—Feb. 7

The Bunker Hill & Sullivan Company, having overhauled and improved the Sweeny mill, which it acquired through the settlement of litigation with the Federal Mining and Smelting Co., is now using the plant for retreating a large pile of tailings, the accumulation of many years while the mill was being operated by the Federal on Last Chance ore. In addition to yielding a small profit, the mill product is especially desirable for the Bunker Hill smeltery on account of the unusual amount of iron.

DENVER, COLO.—Feb. 7

The Mining Bureau of the Denver Civic and Commercial Association elected the following directors at its annual meeting: Richard A. Parker, R. A. Gordon, W. L. Loveland, C. H. Harrington, E. E. Chase, George L. Nye, Robert Hursh, W. H. Leonard and Fred Carroll. These directors will meet soon to elect the bureau's officers for the year.

"The Announced Reduction in Wages paid miners in the copper districts of the country shows the fairness of the copper producers toward the miners, in that they will continue production rather than throw thousands of miners out of employment at this time." This statement was made by Charles H. Moyer, president of the International Union of Mine, Mill and Smelter Workers, in discussing wage reductions of $1 a day, announced at Butte, Mont., on February 6.

SALT LAKE CITY, UTAH—Feb. 7

The Oil-Shale Boom, in common with mining in general in Utah, has been adversely affected to a marked degree, by present economic conditions, although the causes of the lessened interest are somewhat different. In the present uncertainty new enterprises, especially those that are still in the experimental stage, are the first to exhibit the decline in public favor. Also the bringing in of new wells in Texas and Mexico is a factor. It is to be hoped that experimentation with oil shales will be continued, despite the present conditions.

The Question of Mine Taxation is again exciting the concern of those interested in the industry. The bill now before the state Legislature proposes to tax metalliferous mines at some multiple of their net proceeds, plus an assessment of $5 an acre on all mining claims, whether placer or lode. Mills and smelting plants for the treatment of ores of a mine, whether at the property or not, are also to be taxed as part of the mining property in question. This proposed law, together with the new occupation tax, which the state is seeking to impose, is being actively opposed by mining men. The present method of taxation, namely on the annual net proceeds plus the value of surface equipment, is felt to be sufficiently heavy, and those interested in the industry, already halting under the burden of adjustment to post-war conditions, must view with concern any proposal to increase those burdens in any way. In the case of non-metalliferous mines, it is proposed to make assessment at their actual cash valuation. The arbitrary nature of such a procedure,

as well as the difficulty of arriving at a just figure, has already been pointed out in these columns.

DULUTH, MINN.—Feb. 6

Employees of the United States Steel Corporation on the Minnesota and Michigan ranges were benefited to the extent of $37,146.60 in 1918 by the operation of the corporation's pension fund. Details of the eighth annual report of the fund show that out of a total of $709,052.82 disbursed, employees of the Oliver Iron Mining Co. received $34,628.44, employees of the Duluth & Iron Range R.R. $1476.60, and employees of the Duluth, Missabe & Northern, $1041.60.

The Annual Report of the State Auditor of Minnesota shows that the state trust funds were enriched by $1,227,000 during 1918 through royalties and rentals from state-owned iron lands. Of this amount $1,177,359.25 was received as royalty at 25c. a ton on the 4,709,437 tons shipped from state-owned mines, and approximately $50,000 accrued from rentals and minimum royalties. The state owns the fee on approximately one-ninth of the mineral-bearing lands so far discovered in Minnesota.

Fire Broke Out in the Belgrade Mine, at Biwabik, Minn., in the underground workings, on Feb. 1, one miner losing his life through suffocation. All shafts were immediately sealed. The Government mine-rescue car arrived from the Michigan ranges the next day. The fire is reported well under control, and operations will probably be resumed soon. The Belgrade is one of the larger underground properties of Pickands-Mather & Co., producing at the rate of 20,000 tons per month during 1918.

The Shenango Furnace Co. took a new step in welfare work on the Minnesota ranges when on Jan. 15 the company put in force $300,000 of life insurance for the benefit of those of its employees eligible under the plan. The amount of insurance is based on length of service, starting with a minimum of $1000 at the end of six months' continuous service, $100 being added for each additional year of service until the maximum of $2000 is reached. The entire premium is paid by the company, and the face value of the policy is payable to the beneficiary regardless of place or cause of death.

HOUGHTON, MICH.—Feb. 8

Freight Haulage Rate on Copper Ore has been reduced, according to a ruling of the regional railway director just received by the Franklin Mining Co. This ruling is likely to assist Franklin still further in keeping the balance on the right side of the ledger. The ruling reduced the rate from mine to mill from 20c. a ton to 16c. Before the Government took over the railway service, the Franklin paid 9c. a ton for this haulage. The first advance was to 12c., and from 12c. the rate was raised to 20c. a ton, an unfair proposition from any point of view. The Franklin management vigorously protested, but was unable, for a long time, to get a hearing on its case. However, after the matter had dragged along from one office to another, the case finally reached the regional director, and the decision refunds to the Franklin company the excessive amount paid for freight on copper rock.

With Many Men Unemployed in other industrial centers of Michigan and throughout the northwest, not a man in the Lake Superior copper district is without work, although production of copper has been curtailed at the majority of the larger producing properties and there has been a reduction in wages at several of the smaller ones. On the other hand, the mining companies continue to take on old employees, who are returning to the district in considerable numbers, and are also giving employment to returning soldiers and sailors. At present, curtailment of production has become necessary, although some producers are sold far ahead, notably Copper Range, and others are contracted for the first quarter of this year. Some small shipments of copper are being made to France, in the form of billets, by Calumet & Hecla. Mohawk and Wolverine are not reducing production, the management stating that "customers must be supplied," giving the inference that these companies are also contracted well ahead. The copper companies, it is understood, do not approve of the proposed legislation for restricting immigration for four years after the signing of the peace treaty. Whether or not they will make representations to Washington in this regard has not been stated. Such restriction, it is maintained, will mean cutting off the greater portion of the supply of unskilled labor of the character used in this district.

January Tonnage of Copper Mines in Lake Superior region showed increase over that of December and November, despite the facts that influenza kept many men away for many shifts in January and that the mines went on three-quarters time on Jan. 20, thus cutting off two shifts in addition to New Year's Day. It is another illustration of the increase in efficiency per man when conditions begin to look serious. Putting the mines on three-quarters time is not likely to cut into production to any extent, but will probably decrease copper costs per pound. Without appreciable increase in underground working forces at the Calumet & Hecla, the rock tonnage two days last week went as high as 11,000 per day, the best showing made inside of a year. Every day it ran over 10,000. Up to the middle of January it rarely went over 9500 tons per day. The Osceola mine produced 20,300 tons in January, about the same as December and comparing with 19,630 tons in November. The Kearsarge branches of the Osceola property produced 73,500 tons in January, 69,250 in November, and about the same in December. Ahmeek's output was 81,400 tons in January, compared with 81,000 in November and December. Allouez showed 38,500 tons in January, an increase of 300 tons over November and December. Superior continues to ship, but the mine is apparently ending its career of activity, and last month produced only 5550 tons of copper ore. La Salle was the only Calumet & Hecla subsidiary which showed a falling off as compared with last December, being 300 tons short of December but 1000 tons better than November. Isle Royale continues to make a fine showing, the rock tonnage for January being 71,800, compared with 71,100 for November. Mass showed 16,100 for January, against 15,330 for November. Franklin produced 23,950 in January, an increase of 1000 tons over November and 1200 tons over December. Hancock Consolidated produced 17,280 tons in January and 17,000 tons in December.

ISHPEMING, MICH.—Feb. 8

The McClure Hydroëlectric Plant on Dead River is expected to commence the generation of power for the operation of the Cleveland Cliffs Iron Co.'s mines and shops in Marquette County the latter part of the month. The plant will have a capacity of 8000 hp. and is the largest hydro-electric unit in the upper peninsula. The company already has four hydro-electric plants in operation, one on Dead River, one on the Carp River, another just below Au Train Falls, in Alger County, and the fourth, which is of small capacity, at the Republic mine, Republic. With the additional power secured from the new plant, the company will be able to electrify practically all of its plants in Marquette County.

MARION, KY.—Feb. 6

The Advanced Price of Fluorspar during the war period resulted in much new development in mining that mineral in the western Kentucky-Illinois district. However, no new mine of potential importance was brought in, and, although some may have looked for an overproduction of fluorspar in 1918, the output was actually little different from that of 1917. Production continued from the old properties, there being only a few established producers in the district. It is believed now that, more than ever, the resources of these mines will be rapidly depleted. Up to the end of 1918, fluorspar operators were optimistic, but January saw a change to pessimism. Fluorspar is generally sold on annual or time-period contracts. Under the stress of rushing business prior to the armistice, consumers doubtless had 60 to 90-day stocks on hand, which will now probably last twice as long. This has tended to promote cancellations. January witnessed great retrenchment, many operations closing down or stopping all work except development and pumping. The eastern Kentucky fluorspar field made a substantial production in 1918 for the first time. The deposits in this field are small and thin and do not promise a long-lived industry. It is not thought that the western deposits can figure materially in the large eastern markets. The occurrence of fluorspar in commercial quantity is restricted to localities in Kentucky, Illinois, Colorado, New Mexico and New Hampshire, with possibly an important deposit at Modoc, Ontario. The impression has prevailed in the past that the resources of the western Kentucky-Illinois field were illimitable, whereas the tonnage of available fluorspar in sight is small. Much money has been lost hitherto in attempting to mine and market the mineral at low prices, about or near production cost, when wages were low and cost of supplies was normal.

VICTORIA, B. C.—Feb. 6

The Northwest Kootenay Mining Association is being organized by the mining companies of the Golden and Windermere districts of British Columbia. The object will be to encourage mining in that section and to assist in any way that may suggest itself in advancing the industry.

Legislation Affecting the Policy of the Granby Consolidated Company, as well as of other mining and manufacturing companies, in maintaining what are termed "closed towns" in those areas near their plants where homes are provided for, is proposed by T. D. Pattullo, Minister of Lands for British Columbia. The companies' explanation for their course in this regard is that it is in the interest of their respective businesses that agitators and idlers, and people generally with no particular business, shall be kept out of such centers. On the other hand, the Minister of Lands takes the position that the right of any private corporation arbitrarily to prohibit intercourse between the members of its particular community with the outside world is questionable; that it results in the restraint of free competitive trade, and is an unjustifiable interference with the freedom of the subject. It is not proposed by the Government, however, to place any law on the statutes which will force the companies to throw open their towns to the same extent as are the usual run of municipal corporations. The Lieutenant Governor will be given power to declare certain communities company towns, within the limits of which the public shall have free right of ingress and egress over the ways and roads used by the companies as avenues of traffic, but it is not intended that the ways immediately adjacent to the works themselves, and used solely in connection with actual industrial operations, shall be deemed avenues of traffic. In other words, the prohibition will be lifted as regards avenues of traffic which are in the townsite proper and on which are situated the various public offices and public buildings. Provision also will be made for wharf accommodation for public traffic and use in cases of those towns where water transportation is the only means of approach.

TORONTO, ONT.—Feb. 7

Mine Operators of Cobalt are encouraged to increase their output by the decisive decrease in the cost of supplies. Steel plate has dropped from 12c. to 6c. per lb.; copper wire has decreased 9c. per lb., and dynamite and chemicals are rapidly declining in price. Full forces are now available, and inefficient workers are being replaced with a better class of men. With decreased costs and greater labor efficiency, it will be found profitable to treat large tonnages of low-grade ore formerly classed as waste.

The Influx of Labor into the Porcupine camp has been increased by the arrival of many laborers laid off by the International Nickel Co. at Sudbury. The leading gold-mining companies are anxious to increase their working forces, but the principal difficulty in the way is the lack of house accommodation. At present there is no room for new arrivals. The Hollinger Consolidated is planning the erection of 50 dwellings for its employees, but if the demands by the companies for additional workers are to be met, accommodations on a much more extensive scale must be provided.

A Bounty on Canadian Iron Ore was advocated on Feb. 4, when a large deputation representing Port Arthur, Sudbury, North Bay, Copper Cliff and other northern Ontario districts waited on the Canadian government at Ottawa. The delegation was introduced by F. H. Keefer, M. P., and received by Sir Thomas White, Minister of Finance and Acting Premier, and other members of the cabinet. A resolution submitted emphasized the fact that the iron and steel requirements of Canada are already substantial and will increase enormously in the future. Such requirements have hitherto been largely supplied from outside of Canada, particularly iron ore, of which about 95% has been imported. The deputation urged the payment of a bounty of at least 50c. per ton on Canadian iron ore for a term of 15 years, payments to be made monthly to mine operators, and to be reckoned: (1) when ore is milled or treated, on the long ton weights going into the milling or treating process; (2) when ore is not milled or treated, on long ton shipping weights going to the furnace. Sir Thomas White promised that the request would receive the careful consideration of the government.

The Mining News

ARIZONA

Cochise County

PHELPS DODGE (Bisbee)—January production of copper was 11,878,733 lb., (December, 12,563,000) of which 10,622,733 came from company's mines and 1,256,000 from custom ores. Company's Mexican mines contributed 2,453,000 lb. to total.

CALUMET & ARIZONA (Warren)—This and New Cornelia company at Ajo reduce operating schedule to 60% capacity.

Gila County

OLD DOMINION (Globe)—January production of copper was 2,812,000 lb.; December, 2,686,000 pounds.

SUPERIOR & BOSTON (Globe)—William G. Rice elected chairman of board of directors. T. R. Drummond, general manager of Castle Dome Development Co., elected director and president.

INSPIRATION (Miami)—January production of copper was 6,500,000 lb.; December, 7,350,000 lb. Train service begun Feb. 1 between new station in Lower Miami and mine, connecting with all shifts. Long-used passenger trucks will go out of operation.

MIAMI COPPER (Miami)—January production of copper was 5,273,260 lb.; December, 4,989,435 pounds.

Pima County

NEW CORNELIA (Ajo)—Foundations almost complete and much machinery on hand for experimental flotation plant to handle company's sulphides. Maximum capacity 600 tons a day, but much less to be treated at first. New equipment includes Gates gyratory crusher, Symons crushers, 9-ft. and 10-ft. Marathon mills, 8-ft. Hardinge mill, 28-in. conveyor, 16-in. Inspiration-type and Cole-Bergman flotation machines, classifiers, Deister tables, Dorr thickeners, and similar apparatus. More power equipment added, to care for new mill's demands. Steam-shovel operation in surface-ore handling notably economical, about 400 men being needed for extracting and treating about 5000 tons of ore a day. Working force mainly Mexican or Papago Indian.

Pinal County

RAY CONSOLIDATED (Ray)—January production of copper was 4,470,000 lb.; December, 5,800,000 pounds.

GRAND PACIFIC (Superior)—Repairs completed to compressor plant, damaged by fire. Shaft being sunk, with air hoist, at point on main tunnel, 1000 ft. from portal.

SILVER KING OF ARIZONA (Superior)—New 1000-ft. shaft decided on at annual meeting at Phoenix. Will be outside of old area mined. Milling capacity to be increased to 500 tons a day, with better stoping to be afforded. Mine to have full electric equipment. A. W. Hillebrand president and John Fowle manager.

Yavapai County

BRADSHAW REDUCTION (Crown King)—Closed down gold mill and mines, owing to high operation costs.

ARKANSAS

Boone County

BOO-GRA-LOO (Zinc)—Installation completed of battery of tables and set of cleaning jigs.

GLORIA (Zinc)—George Miller, superintendent, opening up rich strike of free silicate of zinc. Extent of body not yet determined.

Marion County

BIG BELL (Rush)—Work resumed after several weeks' shutdown. Mine and mill both in operation.

EDITH (Rush)—Operations suspended owing to influenza. Will start again when conditions are normal.

Independence County

HARVEY (Batesville)—Force at work in manganese body in cave recently discovered by J. B. Harvey at Penters Bluff. One car shipped from property.

CALIFORNIA

Alameda County

WESTERN MAGNESITE DEVELOPMENT (Livermore)—Legal affairs satisfactorily adjusted in San Fransico Superior Court. Suit resulted from failure of owners to make proper distribution of holdings. Claims amounted to about $63,500, of which amount, $40,500 was for attorneys' fees and court costs.

Eldorado County

BURGER (Placerville)—Working quartz vein on property within city limits. Under lease and bond to N. H. Burger, Placerville; A. L. Conger, Berkeley; and T. B. McLane, Seattle. Will install 30-ton concentrator, electric hoist and mine pump immediately.

MANZANTA (Kelsey)—Old ledge reopened and producing large tonnage medium-grade ore. Additional milling capacity planned. Was one of claims owned by Marshall, reputed discoverer of gold in California, situated near site of Marshall's first blacksmith shop. E. N. Fessier, owner.

Madera County

KAST-BEVER (Raymond)—Recent work discloses payable gold and copper ore. Owners plan to install treatment plant provided further development warrants.

San Benito County

NEW IDRIA QUICKSILVER (Jamestown)—Curtailment in progress; reducing working crews to about 150 men, until conditions warrant adding to quicksilver on hand.

Sierra County

TIGHTNER (Alleghany)—To resume operation, suspended owing to high costs and labor shortage. For about 10 years produced high-grade ore. Now developing large bodies of medium-grade milling ore.

Tuolumne County

GYPSY QUEEN (Tuolumne)—Formerly known as Virginia Quartz, optioned by Cherokee Gold Gravel Co. to Guy H. Canfield.

COLORADO

Boulder County

CARIBOU (Caribou)—Drifting on 600 level opened vein of silver ore. Development continues east of Caribou shaft. John G. Clark, owner and manager.

CONGO CHIEF (Caribou)—Shaft sunk to 180 ft. and two levels opened on vein. Developing promising oreshoot. Will let contract to sink shaft 100 ft. deeper. Will purchase new electrical equipment. S. H. Corfield and A. C. Mead, operators.

UP-TO-DATE (Caribou) — Developing Dardenelles mine.

GOLD COIN (Ward)—J. T. Weber, purchaser, will reopen and resume development in March.

Clear Creek County

GEORGETOWN TUNNEL (Georgetown)—Ore of milling grade opened in recent development. Erection of small mill planned near portal of main tunnel.

WEST SIDE (Georgetown)—Has taken over Hall Tunnel property. Advancing tunnel, now about 3000 ft. long; also drifting on some veins cut by tunnel. First 200 ft. of main crosscut walled with rock, and roof retimbered. During last few months several caves removed, and about 6000 cars of debris cleaned out.

KOBOLD (Idaho Springs) — Drifting from bottom of new 70-ft. shaft. Small vein of rich ore opened with considerable milling-grade ore. Charles L. Jaynes, of Idaho Springs, superintendent.

SILVER GEM (Idaho Springs)—Has purchased Silver Horn property in Ute Creek. To begin development within 60 days. New equipment ordered.

DENBIGH (Silver Plume)—Will install double-drum electric hoist, and another electrically driven air compressor. H. S. Bushnell, manager.

Gilpin County

FIFTY GOLD MINES (Black Hawk)—Planning to unwater Gregory incline and resume development on lower levels.

STAR TUNNEL (Blackhawk)—To reopen North Clear Creek property, and overhaul and operate Iron City mill.

BECKY SHARP (Central City)—Property in Russel Gulch, owned by Old Town Mining Co., being developed by Mollard, Giller & Ingels, lessees. Shaft sunk to 400 ft. and drift run 75 ft. on vein. Payable ore opened.

Moffat County

DOUGLAS MOUNTAIN COPPER (Craig)—Building wood-burning reverberatory to smelt 18-20 tons copper ore daily; about 8000 tons 15% copper ore broken or blocked out, which cannot be handled profitably without reduction, owing to situation 71 miles from railroad. All material purchased and on ground. Completion delayed by influenza; probably ready for firing in April.

Montrose County

CASHIN (Montrose)—Copper property being examined by J. M. McBride, former superintendent, with view to reopening after 12-year shutdown.

San Juan County

ARIADNE (Gladstone) — Advancing crosscut tunnel to prospect property at depth. A. B. Iles manager.

GOLD KING (Gladstone)—Operated under lease by John Clements and Michael Kohler. Recent development opened body of high-grade gold quartz ore.

CONGRESS (Red Mountain) — King, Lovingood & Co., lessees, developing and operating. Shipping two wagon loads daily of payable copper ore to Durango, via Silverton. Hauling by wagon to latter point, Silverton Northern road having discontinued service to Red Mountain district. Storage facilities provided at mine for ore produced when wagon road is snowbound.

SILVERTON SHIPMENTS in January were: Sunnyside, 27 cars; Iowa-Tiger, 18; Mayflower Leasing 3; Caledonia and Dives Leasing 2 each; Little Nation, 1; miscellaneous, 24; total, 77 cars.

LACKAWANNA (Silverton) — Development continues with favorable results. Second-level drift advanced 60 ft. in payable ore. Heading on first level advanced 200 ft. in milling ore. Development continued on both levels. Two-compartment raise, recently completed for 140 ft., timbered with square sets.

RUBY (Silverton)—Leased by Radiant Mining and Reduction Co., of Silverton. Henry M. Kinsley president of new company, and O. L. Keen secretary. Tunnels cleaned out and being retimbered. Will overhaul and equip mill to treat 50 tons ore per day. Active operations will begin soon.

WAR EAGLE (Silverton)—Property on Treasure Mountain leased to Peter Holmgrain. Will begin development soon.

San Miguel County

TELLURIDE SHIPMENTS in January were: Smuggler-Union and Black Bear, 70 cars to Durango, and 10 to Pueblo; Tomboy, 40 cars to Durango and 3 to Pueblo; total, 123 cars. January shipments last year were 122 cars.

NEW ERA (Sawpit)—High-grade roscoelite ore developed by D. H. Donegon, operator. Ore being hauled by wagon to Primrose Chemical Co. at Vanadium; about 200 tons mined recently.

PRIMOS CHEMICAL (Vanadium)—Developing vanadium-ore deposit about three-quarter mile north of Placerville. Two-bucket tramway built from mine to railroad. Compressor plant built and steam-driven compressor installed. Blacksmith shop equipped with drill-steel sharpener. Air line laid to mine and air drills installed. Loading switch put in by railroad.

Teller County

GRANITE (Victor)—Will develop on large scale in 1919. Work now under way from Gold Coin and Dillon shafts. Much payable ore opened from Dillon shaft. C. M. MacNeill president and C. C. Hamlin vice-president and general manager.

MARY McKINNEY (Victor)—J. L. Wilson, lessee, opened oreshoot through Anaconda tunnel, at junction of Virginia M. and Work veins. Trial shipment made.

TRILBY (Victor)—Being operated to depth of 1400 ft. through Jackson shaft of Gold Sovereign M. and M. Co., by Evan J. Williams & Co., leasing from Cresson company. During January 125 tons milling ore shipped to Golden Cycle plant at Colorado Springs.

IDAHO

Shoshone County

BIG CREEK (Wallace)—New compressor building completed week after old one burned down. New motor delivered. Will repair old compressor and receiver.

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—Installing two new heads at Point Mills. Work delayed by late delivery of steel and equipment. At Lake Linden, using new Hardinge mills recently installed and pushing construction of flotation plant.

KEWEENAW (Calumet)—Plans dropped of reopening in spring, as intended when work stopped. Necessary funds not available.

SENECA (Calumet)—Two-thirds, or 200 ft., of concrete work done in shaft on turn. Men working during this period on flat rate. On resuming shaft operations, will put shaft through vein, sinking for 100 ft.; will then drift west 60 ft., afterward opening on vein. Estimated six weeks necessary for this work. Crusher expected Mar. 1; will crush first rock by April 1.

FRANKLIN (Demmon)—Running both No. 1 and No. 2 shafts. No water trouble at No. 2, as water all goes into No. 1. Twenty good miners added to working force at this shaft, and 10 more will be put on as soon as possible. No underground exploration work being done, all energies being directed to mining ore opened up. Wages cut 20 per cent.

HANCOCK (Hancock)—Closed down, some of best miners going to Franklin, at Boston location; others to Quincy.

QUINCY (Hancock)—Excavating progressing for plant for recovering mineral from sands.

MASS (Mass)—Operating full time. Wages cut 15 per cent.

MOHAWK (Mohawk)—Will resume mining at No. 1 shaft, idle since May. One shift working; tonnage 300 daily of well-selected rock. Two shifts at shafts Nos. 4, 5, and 6, tonnage being 2200, averaging 23 lb. per ton. Showing in Nos. 4 and 5 improving; in No. 6 getting lean.

BALTIC (Painesdale)—Mill now handling output of Michigan mine formerly sent to Winona mill, latter having suspended operations.

COPPER RANGE (Painesdale)—Experimenting for some time with finer regrinding process; loss of copper reduced to five pounds per ton; eventually three pounds.

Iron District

PENN IRON (West Vulcan)—To suspend at No. 3 East Vulcan shaft. Will provide for some men employed there, discharging about 40. At West Vulcan and other mines, will reduce forces slightly. Wage reduction averaging about 10% scheduled at all company's mines to date from Feb. 1, being practical return to last October's scale.

MINNESOTA

Cuyuna Range

FEIGH (Ironton)—Foundations for headframe completed, and steel headframe will be erected at once. Will completely electrify equipment. Iron ore producer.

Mesabi Range

HAWKINS (Nashwauk) — Wisconsin Steel Co.'s property closed down for six weeks to permit general overhauling of equipment.

MONTANA

Silver Bow County

ANACONDA (Butte)—January production of copper was 15,900,000 lb.; December, 21,900,000 lb. Operations curtailed about 75%, working force being confined to married men and those with dependents. No Sunday work being done. Foregoing correct to Feb. 7 when I. W. W. ordered strike, mentioned on p. 337.

EAST BUTTE (Butte)—January production of copper was 2,291,950 lb.; December, 1,929,720 pounds.

TUOLUMNE (Butte)—January production was 250,000 lb. copper and 41,000 oz. silver.

NEVADA

Humboldt County

CONTROLLING INTERESTS IN ROCHESTER MINES, Nenzel-Crown Point, Rochester Merger, Rochester Elda Fina, and Rochester Combined companies have filed stipulations covering consolidation under new organization title. Pending litigation between Rochester Mines and Elda Fina companies will be eliminated through this agreement. Announced February 7.

RYE PATCH MINES (Rye Patch)—Following officers and directors elected: B. F. Bauer, George W. Morgan, Judge H. A. Smith, Clinton D. Day, C. W. Peck, Sr., Lorin Hall and Joseph E. Ray, all of Salt Lake City. Development planned. Operations of last year under direction of American Mining and Exploration Co. Ore bins constructed at property and unloading platforms built at railroad, three miles away. Road improved from mine to railroad.

UNIONVILLE (Unionville)—Directors decide to push construction of amalgamation and cyaniding mill.

Lincoln County

RONNOW (Comet District)—Lessees shipping carload of lead-silver ore from new orebody recently encountered.

TUNGSTEN-COMET (Comet District)—Rebuilding boarding house, recently destroyed by fire, preparatory to resuming operations.

PIOCHE DISTRICT ore shipments for week ended Jan. 30 were: Prince Consolidated, 31 cars; Virginia-Louise, seven; Consolidated Nevada-Utah, two.

CONSOLIDATED NEVADA-UTAH (Pioche)—Several sets of lessees at work. Combined Metals lease recently opened up shoot of high-grade silver ore, of which one carload is being broken weekly. McCormac lease, employing 15 men, shipped five cars, and Ronnow and Willoughby lease one car, during January. Hagel and Carman dump lease have carload ready for shipment.

HARNEY (Pioche)—Leased to Stindt and Donohue, who have recently developed small shoot of high-grade ore.

VIRGINIA-LOUISE (Pioche)—December production 1135 tons of iron-manganese fluxing ore, averaging 0.01 oz. gold, 4.6 oz. silver and 4.48% lead, per ton. January production estimated at 1500 tons. New areas of highly basic fluxing ore recently opened up. Development work, previously confined to portion of property immediately adjacent to Prince Consolidated ground, now in progress in hitherto unexplored territory, into which orebodies have been proved to extend.

Mineral County

EDWARD WAGNER TUNGSTEN (Mina)—Completed 60-ton concentrator Dec. 15; ground broken Sept. 1; estimated cost, $2500. Property in Silver Dyke Gulch. J. H. Ratcliffe, superintendent.

Nye County

TONOPAH KAWICH (Tonopah)—Development resumed Feb. 1 at property at Belle-helen. Shut down since Christmas. Will center operations in drift started from 350 level of shaft, working one shift.

White Pine County

NEVADA CONSOLIDATED (McGill)—January production of copper was 4,400,000 lb.; December, 5,800,000 pounds.

NEW MEXICO

Grant County

LAST CHANCE (Lordsburg)—Rehandling dump. Mill capacity 70 tons.

OCTO (Lordsburg)—Repairing machinery. Will start mining soon. E. J. Ernest, superintendent.

85 MINE (Lordsburg)—Annual meeting of directors Jan. 27 decided tentatively to install battery of boilers and 1000-hp. steam turbine to replace Diesel engine which exploded recently, causing shutdown of mine and mill.

GREAT EAGLE SPAR (Red Rock)—Working steadily getting out high-grade fluorspar.

CHINO COPPER (Santa Rita)—January production of copper was 4,241,000 lb.; December, 5,508,000 pounds.

TEXAS

Matagorda County

TEXAS GULF SULPHUR (Matagorda)—Mine nearing production. W. H. Aldridge made president.

UTAH

Beaver County

UTAH LEASING (Newhouse)—Company treating Cactus dump of South Utah company by flotation reported seeking lease of Cactus mine.

Juab County

TINTIC STANDARD (Eureka)—Hoisting equipment arrived last week in January; of latest type, electrically driven and large enough for future demands. Recent additional work on 1350 level taxing present hoist to limit. Will start new work on 1450 level when new hoist is installed. About 1400 tons ore shipped week ended Feb. 1.

Salt Lake County

QUEEN LEASING (Salt Lake City)—C. R. Greene and associates operating under this title pushing extraction of ore in upper Cardiff workings. Expect to ship 30 tons weekly. Ore hauled to Utah Sampling Co.'s Murray plant by teams, permission having been given by county commissioners.

UTAH COPPER (Salt Lake City)—Wages of miners and millmen reduced approximately 75c. per day, effective Feb. 7. With copper below 22c. and down to 18c., employees at mines who received basic wage in excess of $4.15 per diem will be reduced at rate of 12½c. for each 1c. decrease in copper price, but all other employees will be reduced at rate of 10c. for each 1c. decrease. January production of copper was 10,500,000 lb.; December, 13,835,000 pounds.

Summit County

SILVER KING CONSOLIDATED (Park City)—Spiro tunnel in 9250 ft.; advancing 10 ft. per day with two shifts. New mill shipped third car concentrates recently. Mill operating two shifts.

WASHINGTON

Ferry County

KNOB HILL (Republic)—Operated at loss in 1918, costs being 75% more than in 1917. Prospecting for new bodies. Gold producer.

CANADA

British Columbia

GRANBY CONSOLIDATED (Grand Forks)—Notice posted at smeltery that company purposes reducing wages according to schedule affected by drop in copper price.

FLORENCE SILVER (Ainsworth)—Produced 350 tons of concentrates in January. Preliminary settlement on 140 tons shipped early in month brought $9500, or 90% of net value, according to F. R. Wolfle, president. Mine and mill force reduced to 60 men since Dec. 1, through adoption of economic methods in handling ore. Raising 240 ft. from fifth to third level to give outlet for waste and ore; on completion will run mill three shifts, insuring output of 500-600 tons concentrates monthly. Fifth level 700 ft. deep.

Nova Scotia

NOVA SCOTIA STEEL AND COAL COMPANY (Sydney Mines)—Steel plant closed down temporarily on Feb. 3. No more pig iron will be manufactured for time being. Openhearth blast furnaces and coke ovens will undergo extensive repairs. Four batteries of coke ovens will be kept in operation.

Ontario

COBALT SHIPMENTS by three mines in week ended Jan. 31 totaled 241,492 lb. Shippers were: Buffalo, 87,685 lb.; Beaver, 86,460 lb.; and La Rose, 87,347 lb. Nipissing shipped 200,000 fine ounces silver bullion in same period.

HOLDINGS OF DOME MINES and Dome Extension Mines, at Porcupine, amounting in all to about 600,000 shares, purchased from De Lamar estate by syndicate headed by J. S. Bache & Company.

TEMISKAMING (Cobalt)—At annual meeting on Feb. 4 shareholders agreed to purchase the Dolly Varden and Wolfe silver mines, in British Columbia, for $900,000.

VIPOND-NORTH THOMPSON (Porcupine)—Reports of consolidation with Porcupine Crown and Thompson-Krist officially denied.

INTERNATIONAL NICKEL (Sudbury)—Cream Hill mines closed down; 800 men laid off. Will draw ore from high-grade deposit at Creighton mine.

AFRICA

CITY DEEP, LTD. (Transvaal)—Reported in November to be sinking new circular shaft, to be between 6000 and 7000 ft. deep. Shaft situated behind Wood House Place. Then down about 200 feet.

The Market Report

SILVER AND STERLING EXCHANGE

Feb.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Feb.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
6	4.7575	101⅛	48 7/16	10	4.7580	101⅛	48 5/16
7	4.7580	101⅛	48 7/16	11	4.7580	101⅛	47¾
8	4.7580	101⅛	48 7/16	12	.....	.....	.....

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Feb.	Copper Electrolytic	Tin Spot.†	Lead N. Y.	Lead St. L.	Zinc St. L.
6	18	66¼	5	4.70	6.10 @6.20 6.30
7	18	66¼	5	4.65	@6.40 6.35
8	17¾ 17½	66¼	5	4.65	@6.45 6.35
10	@17¾	66¼	5	4.65	@6.40 6.17½
11	17	66¼	5	4.65	@6.22½
12	.....	.....	.....	.....	.....

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. Special shapes command a premium and cathodes sell at a discount.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

†For American tin of 99% grade.

LONDON

Feb.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
6	83 @85	76½ @77½	105	239½	236½	29½	26	48
7	83	75	100	233	230	29½	26	48
8	.....	.....	.....	.....	.....	.....	.....	.....
10	80	71	100	225	223½	29	25	48
11	.....	.....	.....	.....	.....	.....	.....	.....
12	.....	.....	.....	.....	.....	.....	.....	.....

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

NEW YORK—Feb. 11, 1919

With the reëstablishment of free competition, copper was naturally the metal of most interest this week. Lead was dull and uninteresting. In zinc there was a little speculative rally, which did not amount to anything.

Our European advices are to the effect that the manufacturing position in Great Britain is grave. Uncertainty as to prices, uncertainty as to politics, extravagant claims of labor, and, above all, the operation of the excess-profit tax, stifle all enterprise. Overshadowing also, is the "absence of government," absence of authority, and consequent decline in law and order. While the peace delegates are stumbling with their heads in clouds of ideals, business men are praying that they will soon stoop to earth and see what is really needed.

France is excluding new importations, and aiming to liquidate its stocks and its own production.

The stocks of metals in the possession of the British Minister of Munitions on Feb. 1, 1919, were as follows, the corresponding figures for Jan. 1, 1919, being stated in parentheses: copper, 93,815,680 lb. (80,640,000); lead, 96,872 short tons (70,394); zinc, 35,435 short tons (33,924); aluminum, 29,328,080 lb. (26,783,680); nickel, 5,349,120 lb. (4,695,040); antimony, 4178 short tons (3928). The increases doubtless reflect arrivals of metals afloat and stagnation in industrial consumption.

Copper, Tin, Lead and Zinc

Copper—Beginning with Feb. 6 all of the big producers came into the market and made sales if they could. Inquiry from buyers was not very general, however, and nothing but small quantities were requested. Business of the week was therefore mainly in lots of 100,000 to 250,000 lb., but even for those there was sharp competition. There were a few transactions in large lots, which were taken by interests that were willing to make sharp cuts, after which the whole market would fall to the new level. On Feb. 6 such business was done at 18c., while on Feb. 11 two lots aggregating 2½ million pounds were done at 17c. The total business of the week was about 6¼ million pounds.

Our direct advices from Europe are to the effect that France has a stock of 100,000 tons of virgin copper. This is the largest estimate that we have seen. Other private advices put the figure at 50,000 tons. Anyhow, there is no doubt that France has a large stock of copper.

The delegates from the Copper Export Association were due to arrive in Paris today.

Copper Sheets—The base price of copper sheets is 27c. per lb. Copper wire is quoted at 20½@21c. per lb. f.o.b. mill, carload lots.

Tin—Considerable gossip went the rounds, but there is nothing new to be positively reported.

Lead—The American Smelting and Refining Co. reduced its price to 5c. on Feb. 7, and since then has had the market, taking most of the business that was offered, although the aggregate was light. Other producers seemed to be unwilling to seek business by further cutting of prices, but at the close there were signs that the market might possibly be becoming a little weaker.

Zinc—After the price had touched 6.10c. on Feb. 6, the producers who had been selling seemed to have finished, and, some speculative interest having been excited, there was a rally in the market. However, this was quite unconvincing, the demand coming from unimportant, if not undesirable, quarters, and there was no time when producers would not sell to consumers at lower prices than the speculators were bidding. On some non-speculative business, therefore, the market declined again today.

Zinc Sheets—Unchanged at $13 per 100 lb.

Other Metals

Aluminum—31@32c. per lb.

Antimony—Dull and weaker. We quote spot at 7⅛@7¼ cents.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.20 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.40 per lb. in lots of 500 pounds.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Dull and weaker. We quote California virgin at $92@95. San Francisco reports, by telegraph, $95.

Silver and Platinum

Silver—Silver exports for the week ended Feb. 8 for London were 273,000 oz. The demand for Europe at present is light. The bulk of our exports are still for India. It is understood that China would be a buying factor in the market, but for the export license, which is still in force.

Mexican dollars at New York: Feb. 6, 77⅛; Feb. 7, 77⅛; Feb. 8, 77⅛; Feb. 10, 77⅛; Feb. 11, 77⅛; Feb. 12, —.

Platinum—We quote refined ingot at $100.

Palladium—We quote $115@120.

Zinc and Lead Ore Markets

Joplin, Mo., Feb. 8—Blende, per ton, high, $47.40; basis 60% zinc, premium grade, $45; Class B, $42; Prime Western, $41@40; sludge, $37.50; calamine, basis 40% zinc, $25. Average selling prices: Blende, $40.47; calamine, $32.54; all zinc ores, $40.39.

Lead, high, $58.50; basis 80% lead, $55@50; average selling price, all grades of lead, $57.17 per ton.

Shipments the week: Blende, 9747; calamine, 106; lead, 1456 tons. Value, all ores the week, $480,980.

Reports of mills, now aggregating a dozen, closing down on account of the low basis price of ore continue coming in from the Oklahoma field. The falling price of lead, in addition to that of zinc, has been the final determining factor. The Eagle-Picher Lead Co. has closed down its refinery in Joplin, but is still running the smeltery at Galena, Kan. Rumor, unconfirmed, says the American Zinc, Lead and Smelting Co. will close down its lead smeltery at Granby, Missouri.

Platteville, Wis., Feb. 8—Blende, basis 60% zinc, $45 for premium grade and $40 base for high-lead blende. No sales of lead ores reported for the week. Shipments reported for the week are 1364 tons blende and 53 tons galena. For the year to date, the totals are 9368 tons blende and 463 tons galena. During the week 2219 tons of blende was shipped to separating plants.

Other Ores

Tungsten Ore—One lot of five tons of Bolivian ore, of 68% grade, with less than 0.1% impurities, was sold at auction this week at $7.75. Another lot of 15 tons of similar grade was sold at $7.50. These are about the prices that have been intimated as indicative of the market for a fortnight or more back. It is believed that some domestic producers are still operating. Unless they are prepared to meet this level of prices, they would best cease.

Molybdenum Ore—Some business was reported done this week at 85c. for molybdenite of 90% grade.

Other Minerals

Pyrites—Unchanged. Ocean freights are obtainable at 22s. 6d. per ton.

Iron Trade Review

PITTSBURGH—Feb. 10

The January decrease in unfilled obligations reported by the Steel Corporation, 694,884 tons, is a small rather than a large one under the circumstances and compares with a decline of 745,511 tons in December and one of 228,630 tons in November. In the decreases for the three months there is seen no trace of any large cancellations of business previously considered sound, and it is doubtful whether the Corporation management was able to segregate, and keep out of its tonnage statements, all orders that the sudden ending of the war made unnecessary of fulfillment. Shipments in each of the three months were

about 1,200,000 tons a month, while bookings of strictly new business were universally recognized as being light. Any considerable volume of cancellations could have made the decrease in unfilled tonnage in any of the three months actually greater than the shipments.

The demand for finished steel products has on the whole undergone no improvement in the last week, but has rather suffered a further diminution from its already small proportions. Jobbers, for instance, having placed shipping instructions immediately after the war for a little replacement of stock, are now in position to proceed more conservatively, and are ordering only such material as it is certain can be distributed at once. Manufacturing consumers, while in general operating at moderate rates, are keeping stocks down to the lowest possible level. The automobile industry is one of the few consuming industries that is buying freely, and its orders are altogether satisfactory to producers, representing on an average as large a tonnage from week to week as has ever been experienced from this industry. The building trades are almost altogether quiescent. Railroad buying amounts to little, which is natural when the final disposition of the railroad properties remains in doubt, while the Fleet Corporation is finding more cases of overshipment of steel than of undershipment, in relation to the shipping orders it has placed.

Finished and unfinished steel prices are being firmly maintained all along the line, there being no hint of any shading. How long this condition will continue no one ventures to predict, but the trade seems to have an idea that price cutting will be forestalled as necessary, by general and plainly marked reductions by leading steel producers, so that at all times a steady, if inactive, steel market may be maintained. For the last three or four weeks a rumor has been persistently in circulation that formal price reductions following those made about the middle of December will be announced in the near future and several weeks before Apr. 1, the date which many had set as the time for the next reductions. Government steel prices averaged about $40 per net ton above the average quoted prices during the 10 years before the war, to Jan. 1, 1914, so that the December reductions, amounting on an average to a trifle more than $4 a net ton, did not go very far toward restoring pre-war conditions. It is recognized in practically all quarters, however, that not for several years at least can prices decline to pre-war levels.

Pig Iron—Sales are infrequent and cover only small tonnages, for prompt shipment only, running from carloads to 100 tons or possibly 150 tons. They are sufficient to show the market situation, which is one of extreme inaction but of steady prices. Shipments on old contracts are of fair proportions. We continue to quote: Bessemer, $35.20; basic, $30; foundry, $31; malleable, $31.50; forge, $30, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40.

Steel

Steel—The 29 companies which report to the American Iron and Steel Institute report 3,082,427 gross tons of ingot production in January, against 2,992,291 tons in December, the apparent increase being due to greater number of working days in January. The output was larger than had been generally expected, but February is undoubtedly bringing out a material curtailment in the rate. Prices on regular unfinished steel are strictly maintained: Billets, $43.50; sheet bars and small billets, $47; slabs, $46; rods, $57. Discard steel and shell steel are being offered at low prices, demand for such descriptions of steel being far below the supplies.

Ferroalloys

Ferromanganese—The furnace asking price on 70% ferromanganese, $200 delivered, is purely nominal, as there are no bids even at far below that figure, and resale lots of any size cannot be sold at all. The market may be considered nominal at $175 to $200.

Coke

Coke—Offerings of odd lots of coke, loaded on track and requiring to be moved to save demurrage, are frequent, and some lots could be picked up at $4 or $4.50 for alleged furnace grade, though probably of poor quality. For any tonnage of standard grade, furnace is quotable at $5 and foundry at $6, per net ton at Connellsville ovens. Production has been curtailed, but hardly rapidly enough for the declining consumption, particularly in view of the fact that all furnaces are well supplied with cars ready for unloading and with much coke in transit to them.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.585	85.716	.....	37.742	42.792	.....
Mar.	73.861	88.082	.....	36.410	43.620	.....
April	73.875	95.346	.....	36.963	47.215	.....
May	74.745	99.505	.....	37.940	48.980	.....
June	76.971	99.500	.....	39.065	48.875	.....
July	79.010	99.625	.....	40.110	48.813	.....
Aug.	85.407	100.292	.....	43.418	49.077	.....
Sept.	100.740	101.125	.....	50.920	49.500	.....
Oct.	87.332	101.125	.....	44.324	49.500	.....
Nov.	85.891	101.125	.....	43.584	48.969	.....
Dec.	85.960	101.125	.....	43.052	48.492	.....
Year	81.417	96.772	.....	40.851	47.516	.....

New York quotations cents per ounce troy, 999 fine; London, pence per ounce, sterling silver, 925 fine.

Copper	New York Electrolytic		London Standard		London Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	.....	110.000	.....	125.000	.....
Mar.	23.500	.....	110.000	.....	125.000	.....
April	23.500	.....	110.000	.....	125.000	.....
May	23.500	.....	110.000	.....	125.000	.....
June	23.500	.....	110.000	.....	125.000	.....
July	25.904	.....	119.915	.....	134.915	.....
Aug.	26.000	.....	122.000	.....	137.000	.....
Sept.	26.000	.....	122.000	.....	137.000	.....
Oct.	26.000	.....	122.000	.....	137.000	.....
Nov.	26.000	.....	122.000	.....	137.000	.....
Dec.	(a)	.....	118.447	.....	133.167	.....
Year	24.628	.....	115.530	.....	130.507	.....

(a) No Market.

Tin	New York		London	
	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557
February	92.000	.....	311.525	.....
March	(a)	.....	318.875	.....
April	(a)	.....	329.905	.....
May	(a)	.....	364.217	.....
June	(a)	.....	331.925	.....
July	(a)	.....	360.347	.....
August	(a)	.....	380.900	.....
September	(a)	.....	343.905	.....
October	(a)	.....	335.543	.....
November	(a)	.....	323.550	.....
December	(a)	.....	267.736	.....
Av. year	(a)	.....	330.138	.....

(a) No average computed.

Lead	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	37.227
February	6.973	.....	6.899	.....	29.00	.....
March	7.201	.....	7.091	.....	29.00	.....
April	6.772	.....	6.701	.....	29.00	.....
May	6.818	.....	6.704	.....	29.00	.....
June	7.611	.....	7.511	.....	29.00	.....
July	8.033	.....	7.750	.....	29.00	.....
August	8.050	.....	7.750	.....	29.00	.....
September	8.050	.....	7.750	.....	29.00	.....
October	8.050	.....	7.750	.....	29.00	.....
November	8.050	.....	7.750	.....	31.20	.....
December	6.564	.....	6.324	.....	40.00	.....
Year	7.413	.....	7.222	.....	30.10	.....

Spelter	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	6.922	54.000	56.045
February	7.814	.....	7.639	.....	54.000	.....
March	7.461	.....	7.286	.....	54.000	.....
April	6.890	.....	6.715	.....	54.000	.....
May	7.314	.....	7.114	.....	54.000	.....
June	8.021	.....	7.791	.....	54.000	.....
July	8.688	.....	8.338	.....	54.000	.....
August	8.985	.....	8.635	.....	54.000	.....
September	9.442	.....	9.092	.....	54.000	.....
October	8.801	.....	8.451	.....	54.000	.....
November	8.491	.....	8.141	.....	54.100	.....
December	8.163	.....	7.813	.....	56.050	.....
Year	8.159	.....	7.890	.....	54.180	.....

New York and St. Louis quotations, cents per pound London, pounds sterling per long ton.

Pig Iron Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1918	1919	1918	1919	1918	1919
January	$37.25	$33.60	$33.95	$31.40	$33.95	$32.40
February	37.25	.....	33.95	.....	33.95	.....
March	37.25	.....	33.95	.....	33.95	.....
April	36.15	.....	32.95	.....	33.95	.....
May	36.20	.....	33.00	.....	34.00	.....
June	36.30	.....	33.16	.....	34.16	.....
July	36.60	.....	33.40	.....	34.40	.....
August	36.60	.....	33.40	.....	34.40	.....
September	36.60	.....	33.40	.....	34.40	.....
October	36.60	.....	34.40	.....	35.40	.....
November	36.60	.....	34.40	.....	35.40	.....
December	36.60	.....	34.40	.....	35.40	.....
Year	$36.67	.....	$33.70	.....	$34.45	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Feb. 10
Alaska Gold M.	3⅛
Alaska Juneau	1½
Am.Sm.&Ref.,com.	63⅛
Am.Sm. & Ref., pf.	104⅛
Am.Sm.Sec., pf., A	91½
Am. Zinc	11
Am. Zinc, pf.	39
Anaconda	57⅛
Batopilas Min	1
Bethlehem Steel	59
Butte & Superior	16⅛
Butte Cop. & Zinc	5⅛
Cerro de Pasco	31
Chile Cop.	17⅛
Chino	33⅛
Colo. Fuel & Iron	35
Crucible Steel	53⅛
Crucible Steel, pf.	90
Dome Mines	12½
Federal M. & S.	9
Federal M. & S., pf.	33
Great Nor., ore ctf.	37½
Greene Cananea	42
Gulf States Steel	52
Homestake	97
Inspiration Con.	42⅛
International Nickel	26
Kennecott	30
Lackawanna Steel	63
Mexican Petrol.	165⅛
Miami Copper	22
Nat'l Lead, com.	65
National Lead, pf.	106⅛
Nev. Consol.	16⅛
Ontario Min.	7⅛
Ray Con.	20
Republic I.&S.,com.	72
Republic I.&S., pf.	101
Sloss-Sheffield	46⅛
Tennessee C. & C.	12⅛
U. S. Steel, com.	89⅛
U. S. Steel, pf.	113⅞
Utah Copper	66⅛
Va. Iron C. & C.	55

BOSTON CURB*	Feb. 10
Alaska Mines Corp.	‡.12
Boston Ely	.95
Boston & Mont.	.46
Butte & Bos'n Dev.	11
Calaveras	11
Chief Con	3⅛
Contact	.05
Corbin	‡.25
Cortez	13
Crown Reserve	.55
Crystal Cop.	.19
Eagle & Blue Bell	2⅛
First Nat. Cop	1⅛
Houghton Copper	.30
Intermountain	‡.05
Iron Blossom	.45
Iron Cap	13⅛
Majestic	.19
Mexican Metals	.28
Mines of America	.06
Mojave Tungsten	.04
Nat. Zinc & Lead	.09
Nevada-Douglas	.20
New Baltic	.75
Oneco	.20
Pacific Mines	‡.35
Rex Cons.	.05
Yukon Gold	.75

SAN FRAN.*	Feb. 4
Alta	.02
Andes	.03
Best & Belcher	.02
Caledonia	.03
Challenge Con.	‡.03
Confidence	.04
Con. Virginia	‡.05
Gould & Curry	.02
Hale & Norcross	.11
Jacket-Cr. Pt.	.03
Mexican	.08
Occidental	.40
Ophir	.09
Overman	.01
Savage	.07
Sierra Nevada	.03
Union Con.	.08
Utah Con.	‡.01
Belmont	3.50
Jim Butler	.39
MacNamara	.25
Midway	.27
Mont.-Tonopah	.15
North Star	.08
Rescue Eula	.09
West End Con.	1.20
Atlanta	.04
Booth	.13
Comb. Frac	‡.02
Florence	.12
Jumbo Extension	.12
Kewanas	.04
Nevada Hills	.03
Nevada Packard	.25
Round Mountain	.32
Silver Pick	.04
White Caps	.16

COLO. SPRINGS*	Feb. 4
Cresson Con.	4.87½
Doctor Jack Pot	.04
Elkton Con.	.04
El Paso	.14
Gold Sovereign	‡.02
Golden Cycle	1.74
Granite	.11
Isabella	.05½
Mary McKinney	.07
Portland	1.00
United Gold M.	.147
Vindicator	.44

BOSTON EXCH.†	Feb. 10
Adventure	‡.60
Ahmeek	70
Algomah	29
Allouez	‡43
Aris. Com.	11
Arnold	‡.20
Bingham Mines	19¼
Bonanza	‡.10
Butte-Balaklava	.30
Calumet & Ariz.	57⅛
Calumet & Hecla	430
Centennial	13⅛
Copper Range	40⅛
Daly West	⅛
Davis-Daly	5⅛
East Butte	19⅛
Franklin	3
Granby	‡79
Hancock	4⅛
Hedley	‡12
Helvetia	‡.20
Indiana	‡.80
Isle Royale	24⅛
Keweenaw	1⅛
Lake	‡3⅛
La Salle	‡2⅛
Mason Valley	‡2⅛
Mass	‡4⅛
Mayflower	3⅛
Michigan	2⅛
Mohawk	50
New Arcadian	‡1⅛
New Cornelia	15⅛
New Idria	8⅛
North Butte	10
North Lake	‡.40
Ojibway	‡1⅛
Old Dominion	34⅛
Osceola	‡52
Quincy	57
St. Mary's M. L.	‡43
Santa Fe	‡.25
Seneca	‡13⅛
Shannon	‡2⅛
Shattuck-Ariz.	‡14⅛
So. Lake	‡1
So. Utah	.14
Superior	4⅛
Superior & Bost.	2⅛
Trinity	‡2⅛
Tuolumne	‡.82
U. S. Smelting	43⅛
U. S. Smelting, pf.	46
Utah Apex	2⅛
Utah Con.	7⅛
Utah Metal	1⅛
Victoria	‡2
Winona	‡.90
Wolverine	18

N. Y. CURB†	Feb. 10
Elz Ledge	.75
Butte & N. Y.	1⅛
Butte Detroit	‡.01⅛
Caledonia	.29
Calumet & Jerome	⅛
Can. Cop. Corpn.	2
Carlisle	‡2
Cashboy	.07⅛
Con. Ariz. Sm.	1⅛
Con. Coppermines	5⅛
Goldfield Con.	.20
Goldfield Merger	.05⅛
Greenmonster	⅛
Hecla Min.	4⅛
Howe Sound	‡3⅛
Jerome Verde	‡.50
Louisiana	⅛
Magma	25⅛
Marsh	.03
McKinley-Dar-Sa.	.45
Milford	‡.75
Mother Lode	.29
Nixon Nevada	.39
Ohio Cop.	⅛
Rawley	‡2⅛
Ray Hercules	2⅛
Richmond	‡.56
Rochester Mines	.32
St. Joseph Lead	12
Standard S. L.	.25
Stewart	1.16
Success	‡11⅛
Tonopah	‡3⅛
Tonopah Ex.	2⅛
Tribullion	⅛
Troy Arizona	‡.10
United Eastern	4⅛
United Verde Ext.	‡35⅛
United Zinc	⅛
Utica Mines	‡.08

TORONTO*	Feb. 10
Adanac	.22
Bailey	.03
Beaver Con.	.40
Chambers Ferland	‡.09
Coniagas	2.00
Hargraves	.03
Kerr Lake	‡5.37½
La Rose	.31½
Lake Shore	.90
Min. Corp of Can.	2.00
Nipissing	‡8.75
Peterson Lake	.09½
Temiskaming	.34
Wettlaufer-Lor.	.04
Davidson	.55
Dome Exten.	.27
Dome Lake	.20
Hollinger	6.12½
McIntyre	1.62
Newray	.12½
Porcu. Crown	‡.28
Teck-Hughes	.27
Vipond	.19
West Dome	.15

* Bid prices. † Closing prices. ‡ Last quotations.